DOCUMENT RESUME

ED 445 448 EC 308 052

AUTHOR	Hartman, Melissa E., Ed.
TITLE	Imagine...Opportunities and Resources for Academically Talented Youth, 1999-2000.
INSTITUTION	Johns Hopkins Univ., Baltimore, MD. Inst. for the Academic Advancement of Youth.
ISSN	ISSN-1071-605X
PUB DATE	2000-00-00
NOTE	182p.; Published five times a year.
AVAILABLE FROM	Imagine, P.O. Box 3073, Langhorne, PA 19047; Tel: 215-826--0707; Fax: 215-788-6887; Web site: http://www.jhu.edu/gifted/imagine (annual subscription $25; institutions $30).
PUB TYPE	Collected Works - Serials (022)
JOURNAL CIT	Imagine; v7 n1-5 Sep-Oct 1999-May-Jun 2000
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Academically Gifted; *Competition; *Computers; Elementary Secondary Education; *Gifted; Publishing Industry; Social Sciences; *Space Exploration; Space Sciences; Student Motivation; Student Publications; *Talent Development; *Writing for Publication

ABSTRACT

Designed to encourage gifted students to develop their talents, the first issue in the volume focuses on academic competitions and includes articles on: "The Joys of Competition"; "Why Bother with Math Contests?" (Sam Vandervelde); "Science Competitions"; Humanities Competitions"; "Designing in Metal" (Cody Chance); and "Discovering My Chinese Self: Lessons in Brush Painting" (Jessica Kinlock). The second issue discusses planetary science and includes: "So You Want To Go to Mars" (John Connolly); "Moon, Earth, and Sea: A Cross Section of Planetary Sciences" (Jeff Gills and others); "In Search of M-Class Planets" (Carol Blackburn); "Space Camp: Where Fun and Learning Meet" (Katherine Yakubisin); and "To Live by the Sword: Modern Sport Fencing" (Kara Weinberg). Writing for publication is the focus of the third issue. Articles include: "On Becoming a Writer" (Health Jones); "Making Contact: Cover Letters & Query Letters" (Melissa Hartman); "To Observe, To Think, To Question, To Write" (Nick Sheff); "Penning the Impossible: Writing and Publishing Science Fiction and Fantasy" (Yoon Ha Lee); and "Resources for Writers". The fourth issue focuses on computer technology and includes: "Computer Technology: Reshaping Our Lives" (Jenko Hwong); "The Making of eBiz4Teens" (Melissa Sconyers); "Get with the Program: The USA Computing Olympiad" (Benjamin Matthews); and "The Science of Language: Computational Linguistics" (Jason Eisner); and "Look, Ma, No Hands: Living with Repetitive Stress Injury" (Vasugi Ganeshananthan). The fifth issue focuses on the social sciences. Each issue also includes information about exploring career options, planning ahead for college, college reviews, and book reviews. (CR)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 445 448

Imagine...
Opportunities and Resources for Academically Talented Youth, 1999-2000

Melissa E. Hartman, Ed.

Volume 7, Numbers 1-5
September/October 1999-May/June 2000

U S DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it

☐ Minor changes have been made to improve reproduction quality

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

M. Hartman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

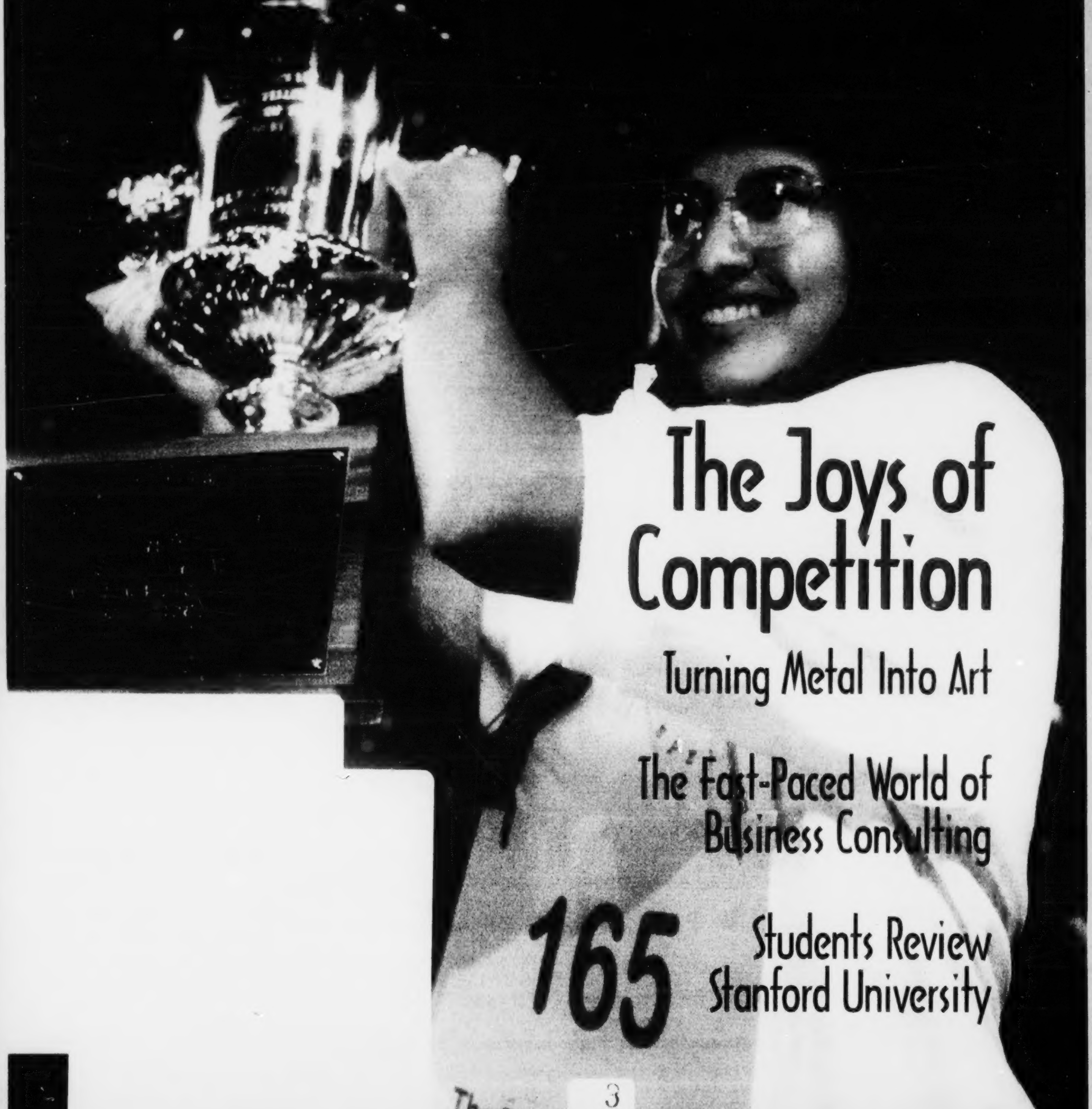
EC 308 052

BEST COPY AVAILABLE

ImaGiNe...

Opportunities and Resources for Academically Talented Youth

Published by the
Johns Hopkins University
Institute for the Academic
Advancement of Youth



The Joys of Competition

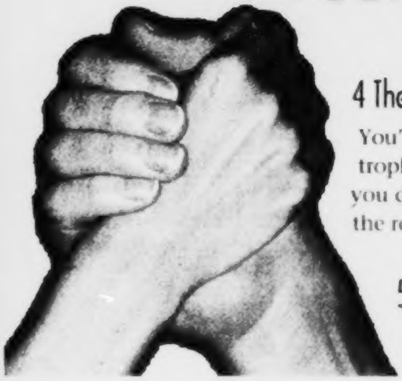
Turning Metal Into Art

The Fast-Paced World of Business Consulting

165 Students Review Stanford University

CONTENTS

Features



4 The Joys of Competition

You'll gain a lot more than just medals and trophies from academic competitions. And you don't even have to win to reap the rewards.

5 Bee-Bound

Interview with 1998 National Geography Bee finalist J.B. Kizer

6 Why Bother with Math Contests?

Sam Vandervelde explains why he never got over his love of high school math contests—and how he's helping to inspire a new generation of mathletes.

7 Mathematics Competitions

9 Living It Up at the ISEF

Taren Stinebrickner-Kauffman and Jennifer Walk, both two-time finalists at the Intel International Science and Engineering Fair, offer insiders' perspectives on "the Olympics of science competitions."

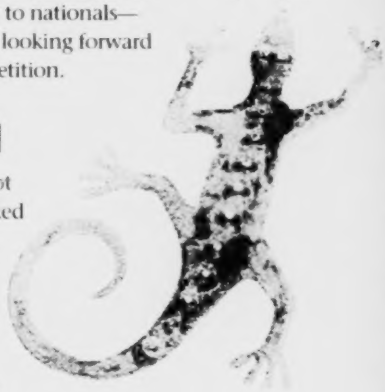
10 Science Competitions

13 Humanities Competitions

16 Multidisciplinary Competitions

18 National History Day: Leaving the Textbooks Behind

Even after five years of participating in History Day—and twice making it to nationals—Fernan Tolentino is looking forward to next year's competition.



27 Designing in Metal

A one-week class got Cody Chance hooked on metalsmithing. Now the 17-year-old artist has one of his works on display at The Corcoran Museum of Art.

28 Discovering My Chinese Self: Lessons in Brush Painting

When Jessica Kinloch enrolled in her first painting class, she tapped into a talent she didn't know she had.

Departments

22 Off the Shelf

Review of E.M. Forster's *A Passage to India*

23 Word Wise

24 Exploring Career Options

Interview with business consultant Emily Linklater

30 Planning Ahead for College

What should you be doing now to prepare for college? Check this calendar for 7th, 8th, and 9th graders.

32 Students Review Stanford University

34 Creative Minds Imagine

Poems by Ben Evans and Elizabeth Lerner

36 Knossos Games

ImaGiNe...

Opportunities and Resources for Academically Talented Youth•

ISSN 1071-605X
Volume 7 • Number 1
September/October 1999

Copyright © 1999 by The Johns Hopkins University.

•A trademark of The Johns Hopkins University.

All rights reserved. No portion of this journal may be reproduced by any process or technique without the formal consent of the Johns Hopkins University Institute for the Academic Advancement of Youth.

Published five times a year—September/October, November/December, January/February, March/April, and May/June.

Application to mail at Periodicals Postage Rates is approved at Baltimore, MD, and additional mailing offices.

POSTMASTER: Send address changes to Imagine, P.O. Box 3073, Langhorne, PA 19047.

Imagine is published by the Study of Exceptional Talent (SET) at the Johns Hopkins Institute for the Academic Advancement of Youth. This publication is an outgrowth of newsletters and programs that, for twenty-five years, have served highly talented students identified by the Study of Mathematically Precocious Youth and by SET.

Editor • Melissa E. Hartman
Assistant Editor • Diane Clavier
SET Director • Linda E. Brody, Ed.D.
Research Associate • Carol C. Blackburn, Ph.D.
Editorial Assistant • Mary Parker
Editorial Assistant • Rachelle Lipschultz
Designer • Delta Graphics & Communications

Annual subscription: $25.00
Institutions: $30.00

Address subscription inquiries to:
Imagine
P.O. Box 3073
Langhorne, PA 19047
(215) 826-0707 • fax: (215) 788-6887

Address editorial correspondence to:
Melissa E. Hartman
SET/IAAY
The Johns Hopkins University
Baltimore, Maryland 21218
(410) 516-0309 • fax: (410) 516-0108
email: mhartman@jhu.edu

Web site: www.jhu.edu/gifted/imagine

On the cover: 1999 National Spelling Bee Champion Nupur Lala displays her trophy. Photo courtesy of the Scripps Howard National Spelling Bee.

WELCOME

...to a new year of *Imagine*! We're excited about sharing another year's worth of opportunities, challenges, and fun with you—all in our improved and expanded format.

If you've been with us for a few issues, you'll notice the changes right away. Now that you've gotten inside our new full-color cover, you'll see that our design has evolved with you in mind. We've added more visuals and made the text easier to read without sacrificing the high quality of our articles.

We've kept most of our regular columns intact. You'll still find *Exploring Career Options, Planning Ahead for College,* and the *College Review* series, as well as puzzles and creative student work, in every issue. And you'll also find *Off the Shelf* among our regular departments. This book review, which takes the place of *Fascinating Classics*, will branch out beyond literary classics to include classics in science, mathematics, history, philosophy, and other disciplines.

With four more pages, we've also found room to include more articles treating topics other than our focus topic. So in this issue about academic competitions, you'll hear not only from students who've participated in the Intel International Science and Engineering Fair, the National Geography Bee, and National History Day, but also from two young artists who create in two very different media—Chinese brush painting and metalsmithing.

Our most important goal has always been to highlight opportunities and resources that will help you make the most of your precollege years. *Imagine* will continue to provide information about programs and activities that challenge, inspire, and reward, from summer programs and internships to school clubs and sports. And by making the changes you see in this issue—many of which were suggested by our readers—we hope to make it easier and more fun for you to learn about the possibilities that await you. ▼

ImaGiNe...
Entering Academic Competitions
The Humanities

(Left to right) *The very first issue of* Imagine, *September/October 1993, was 12 pages long. Student writing—and Tim Boester's puzzle—appeared only in Creative Minds* Imagine. *We chose to revisit that month's focus topic in this issue.*

In Volume 2, we started to focus on general academic areas, such as The Humanities and Science & Technology. Imagine *had grown to 20 pages, four of which featured student writing.*

At 32 pages, Imagine *took its next big step. That year, we changed our cover and experimented with a new design. Student writing accounted for about one-quarter of that issue's content.*

Visit our Web site at www.jhu.edu/gifted/imagine for

- links to competitions
- links to colleges we've reviewed
- resources for academically talented students
- and a page where you can tell us what you think of the new *Imagine*

Coming soon: Imagine readers' listserv!

The Joys of Compet

Competition: a word that sends shivers of excitement (or trepidation!) down the spine. Whether you crave the thrill of battle or cringe at the very thought, competition is an integral part of modern life. But competitions aren't all as cut-throat as you might think. They're designed to inspire and enlighten. They can teach you how to handle the pressures of real-life challenges—and they're also a lot of fun.

Competitions vary widely in subject matter and format, so you'll almost assuredly be able to find several that suit your personal style. You can choose science, math, humanities, or multidisciplinary events. You might work on your own or as part of a team. Some competitions plunge you into a fast-paced one- or two-day event with multiple activities while others allow for months of thought and planning on a single project. Some require you to answer questions in front of an audience, but many don't even require you to leave your own home or school. And the challenges range from correctly answering rapid-fire questions to finding the most creative solution to a given problem.

Best of all, competitions offer a broad range of benefits that you may not have considered before. They enable you to:

Meet kindred spirits. Competing is an excellent way to meet people who share your interests. If you join a team, you'll get to know your teammates and enjoy facing a challenge as part of a tightly knit group. If you go it alone, you'll meet many people along the way who've made the same choice—and you may find that you have more in common than academics.

Travel. Many competitors are as excited about their travels as the events themselves. Competing might take you to the other side of your county or the other side of the world. Wherever you go, it's a great opportunity literally to broaden your horizons.

Delve deeper into something that intrigues you. You can do this without entering a competition, but having a definite goal can push you further and offer greater rewards. Depending on the competition's format, you may have a chance to show others what you've done, establish valuable contacts, and make unexpected discoveries about your field of interest.

Find inspiration in human ingenuity. In creative problem-solving competitions, all contestants have the same goal, but very few achieve that goal in the same way. After you've wrestled with a challenge, seeing how ion

others approached it can be inspiring and instructive. And taking the time to ponder the endless variety of human creativity can open your mind to entirely new possibilities.

Learn to handle both victory and defeat. For many, the experience of participation is more important than the outcome. But competitions do have outcomes, and they can either gratify or disappoint. Learning to accept any outcome gracefully is one of the greatest benefits of throwing yourself into the competitive arena.

Learn about yourself. Competition forces you to work out your own methods for tackling challenges. Do you work best under pressure or in a self-paced environment? Do you work well with others? Are you more comfortable in the role of leader or colleague? Do you enjoy live showdowns, egged on by roaring crowds? Or spending months quietly working on a labor of love? The answers to these questions can often show you unknown facets of your personality.

No matter what place you take in the finals, competing is almost always a win-win situation. At very least, it gives you a reason to push the limits of your abilties—and surprise yourself with what you can achieve. So what are you waiting for? Read on to find a competition that speaks to your sense of adventure. ▼

Bee-Bound

Interview with J.B. Kizer

by Melissa Hartman

Now 14 years old, J.B. Kizer placed ninth in the Ohio State Geography Bee when he was in fourth grade. In the following years, he placed in the top 10 three more times before winning the State Bee—and advancing to the National Geographic National Geography Bee—in his final year of eligibility.

Have you always been interested in geography?

For as long as I can remember. When I was two years old, I could crudely draw maps of the states and the U.S., and I knew state capitals. By the time I was three, I could identify most countries of the world by their outlines.

Since I began taking college classes at age seven, I've taken just about every geography class that our local university offers.

Why do you think it's important for kids your age to know geography?

Geography encompasses so many things, like map reading, which is obviously a needed skill. But it also exposes you to other areas, like the sciences—such as geology and meteorology—and history. A lot of the questions in the Geography Bee actually seem more like history or science questions.

Were you nervous the first time you competed in the Ohio State Bee?

My first year, the Ohio Bee was in a huge auditorium. The audience was in total darkness, and all the lights were focused on the stage. Most of the finalists were seventh and eighth graders, and I was this little fourth grader standing there. I missed two questions I knew because I was nervous.

After you saw what it was like, did you prepare differently?

After the first year, I looked at even more National Geographic materials. I also started looking over summaries of the previous year's current events on the Internet. In the local competitions, there's an entire round on current events.

Looking back, what do you think was most positive about your experience at the National Geography Bee?

For one thing, it was really fun. The National Bee is more than just the competition—I went to National Geographic headquarters in Washington, D.C., attended all sorts of socials, and even took a trolley tour of Washington.

It was also great to meet other people my age with an intellectual bent, who are interested in the same things I am. Portsmouth, Ohio, is a very rural area—the population is only about 22,000—and I don't often get to interact with the same sort of people I met at the Geography Bee. Certainly that was very positive.

What advice can you offer newcomers to the Geography Bee?

The best advice is to remember that the Bee is a fun thing. It's sort of like a game, and so much of it is luck. In last year's State Bee, after already answering one question incorrectly, I was one wrong answer from being eliminated. I don't remember the question, but I remember there was a choice between China and South Korea. I thought about that for all the time they gave us, which was 12 seconds. And finally, when they said "time," I just blurted out "China." And that was right. If I had missed that, I wouldn't have even made it to the state top 10.

Were you pleased with placing second in the National Bee?

Yes, especially since I almost didn't even go to the State Bee because I was sick. Of course I went, but of all the years I participated, I had the lowest expectations that year, and I got the best results.

Do you have any plans for future competitions now that you're no longer eligible for the National Geography Bee?

I'm happy to say that I'll be participating in the International Geography Olympiad in Toronto this August. Based on essays we submitted, National Geographic selected three people and one alternate from among the top 10 finishers in 1998 and 1999 to represent the U.S. Eleven countries will compete.

I am really looking forward to seeing Toronto, but even more to meeting the other participants and learning about their perspectives on the world. ▼

BEST COPY AVAILABLE

Why Bother With Math Contests?

by Sam Vandervelde

While attending middle school and high school, I positively loved math contests. Competing against students from across the state for top mathematical honors was every bit as exciting to me as facing off against our cross-town rivals in the big soccer game. I also took great satisfaction in matching wits with the diabolical minds that created the extra-tough questions appearing on those contests.

In an ironic twist of fate, I now play the part of the fiendish mastermind who develops questions for a math contest called the Mandelbrot Competition. The reason for my continued involvement in high school math contests is simple: I think that mathematics is one of the most fascinating fields of study at any level, and that discovering and sharing new insights is a worthwhile activity.

Beyond Textbook Math

Mathematics is chock full of remarkable results and unexpected theorems. For example, the Fibonacci sequence is a deceptively simple list of numbers beginning {1, 1, 2, 3, 5, ...} in which each subsequent term is the sum of the two previous numbers. Despite this humble definition, a dizzying array of clever identities and beautiful theorems lurk within the Fibonacci sequence. For example, choose two consecutive Fibonacci numbers and add their squares. What type of number results? Can you prove your conjecture?

Today's standard mathematics curriculum emphasizes algebraic techniques, problem solving skills, and, increasingly, methods for implementing graphing calculators. Unfortunately, teachers often focus upon "textbook math" to the exclusion of mathematical gems such as the Fibonacci sequence, leading to a loss of appreciation for the beauty and scope of mathematics. Mathematics contests help to inject vitality into the curriculum by presenting clever problems and introducing accessible topics not ordinarily taught in the classroom.

I once wondered if there was life after high school math contests—until I started writing math problems. Creating an original problem introduces an element of exploration and discovery that is difficult or impossible to replicate in a math contest. For example, upon learning the clever factorization $a^4+4 = (a^4+4a^2+4) - 4a^2 = (a^2+2)^2 - (2a)^2 = (a^2+2a+2)(a^2-2a+2)$, the problem-solver will file this fact away for future reference. However, the problem-writer will experiment with different ways of using this factorization, and perhaps eventually come up with a gem such as "Compute the value of the fraction

$$[(1^4+4)/(3^4+4)]*[(5^4+4)/(7^4+4)]* \dots *[(1997^4+4)/(1999^4+4)]."$$

The answer is surprisingly simple, and can be figured entirely with pencil and paper.

If you notice an interesting pattern or curious formula, try to develop it into a good problem. I would love to see what you come up with—send original problems to me at info@mandelbrot.org. I will post the most creative submissions on the Mandelbrot Competition Web site, located at www.mandelbrot.org.

Math: A Team Sport

I recently spoke with four students who participated for several years in the Mandelbrot Competition. When asked to describe why they enjoyed the contest, they responded that they had encountered many new mathematical topics that were fun to explore. They also discovered that competing against other students from across the United States lent an exciting edge to learning "cool mathematics."

But to these four students, the most rewarding aspect of the competition was working together on the team tests. Mathematics, like any worthwhile human endeavor, is not meant to be practiced in isolation. Many contests afford students the chance to share ideas and make progress on a set of problems as a team; some draw students from a wide geographic area together for a single event. When students come together, a sense of mathematical community develops, the setting in which most mathematics of any consequence occurs. After all, what satisfaction is there in working on a problem that interests nobody else, or hunting for patterns in the Fibonacci sequence if there is no one to share them with? Paul Erdös's greatest criticism of Andrew Wiles was that he insisted on wrestling with the proof of Fermat's Last Theorem entirely on his own.

So enjoy all the challenging math problems and neat ideas that you come across in the upcoming year, whether they appear in a contest or occur to you in a flash of inspiration during health class. Remember that the good questions are the ones you can't solve immediately, and the best ones are those that lead in entirely unexpected directions as you bounce ideas off a friend while solving them. Finally, good luck on this year's math competitions! ▼

Sam Vandervelde *was a member of the 1989 IMO team that took fifth place in West Germany, and was the first place individual at ARML the same year. In 1990, he, Sandor Lehoczky, and Richard Rusczyk started the Mandelbrot Competition. Mr. Vandervelde now teaches mathematics and coaches the MATHCOUNTS team at the Roxbury Latin School, a private boys school in Boston. Outside of the classroom, he coaches seventh grade soccer and junior varsity tennis. During the summer, he races sailboats and plays soccer, tennis, and ultimate frisbee.*

Mathematics

American Mathematics Competitions

Titu Andreescu, Director, American Mathematics Competitions, University of Nebraska-Lincoln, Lincoln, NE 68588-0658; (402) 472-6656; titu@amc.unl.edu; www.unl.edu/amc/

Sample questions from the 1998 AJHSME:

1. For a sale, a store owner reduces the price of a $10 scarf by 20%. Later the price is lowered again, this time by one-half the reduced price. The price is now

A. $2.00
B. $3.75
C. $4.00
D. $4.90
E. $6.40

[C]

2. A 4x4x4 cubical box contains 64 identical small cubes that exactly fill the box. How many of these small cubes touch a side or the bottom of the box?

A. 48
B. 52
C. 60
D. 64
E. 80

[B]

AMC->8 (formerly AJHSME)

Junior high school students in grade 8 or below and home school students age 14 or younger take this 40-minute exam that consists of 25 multiple choice questions. Topics include arithmetic of integers, fractions and decimals, percent and proportion, number theory, informal geometry, perimeter, area, volume, probability and statistics, and logical reasoning. High-scoring students are awarded certificates. **Deadline:** Schools register by November 1, 1999; reduced fee for registering before October 15, 1999. Exam will be held November 16, 1999.

Sample questions from the 1999 AHSME:

1. What is the sum of the digits of the decimal form of the product $2^{\text{[illegible]}} \bullet 5^{\text{[illegible]}}$?

A. 2
B. 4
C. 5
D. 7
E. 10

[D]

2. Let x be a real number such that secx - tanx = 2. Then secx + tanx =

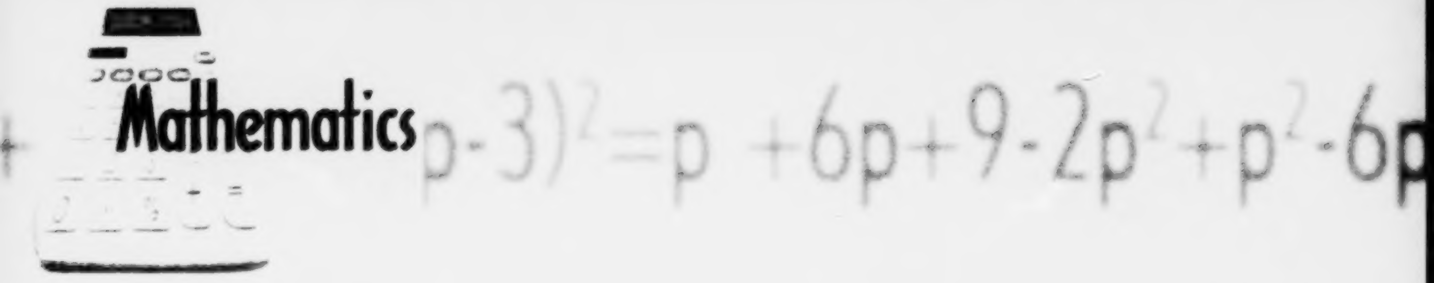
A. 0.1
B. 0.2
C. 0.3
D. 0.4
E. 0.5

[E]

AMC->10 and AMC->12 (formerly the AHSME)

New in the year 2000, the AMC->10 is for high school students in grade 10 or

ARML 1999. ***Left:*** Students in deep concentration during the Individual Round. ***Right:*** The Eastern Massachusetts A team, winners of the 1998 ARML at Penn State.



Mathematics

below and home schoolers age 16 or younger. The AMC->12 is for advanced high school students in any grade and home schoolers age 18 or younger. Both 75-minute exams consist of 25 multiple-choice questions on noncalculus secondary school mathematics topics. Students who score at least 100 out of the possible 150 points on the AMC->12 and those who score in the top 1% on the AMC->10 are invited to take the AIME (see below). **Deadline:** Schools register by January 15, 2000; reduced fee for registering before December 31. Exam will be held February 15, 2000.

American Invitational Mathematics Examination

The three-hour AIME is made up of 15 questions, with integer answers from 0 to 999, that can be solved using precalculus methods. All participants receive a Certificate of Participation, and the top-scoring participants (based on a weighted average that includes AMC->10 and AMC->12 scores) are invited to take the USAMO (see below). **Deadline**: Students must be invited to take this exam which will be held March 28, 2000.

Sample questions from the 1999 AIME:

1. Find the smallest prime that is the fifth term of an increasing arithmetic sequence, all four preceding terms being also prime.

[29]

2. Find the sum of all positive integers n for which $n^2 - 19n + 99$ is a perfect square.

[38]

U.S.A. Mathematical Olympiad

Six weeks after the AIME, approximately 180 qualifying students take the USAMO, a six-hour exam consisting of six essay/proof questions. The eight top-scoring students are invited to the Olympiad Awards Ceremony in Washington, D.C. These winners and 16 other finalists attend the four-week Mathematical Olympiad Summer Program. The top six scorers on the USAMO form the team that represents the U.S. in the International Mathematics Olympiad, a two-day examination for the most talented students from more than 70 countries. The 2000 IMO will be held in South Korea.

American Regions Mathematics League

Mark Saul, President, American Regions Mathematics League, 711 Amsterdam Avenue, New York, NY 10025; (212) 666-5188; msaul@compuserve.com; www.rose-hulman.edu/Class/ma/rickert/HTML/ARML

High school students form teams of 15 to represent their school, city, county, or state in this annual national competition. Students compete in four rounds: Team (all 15 members work together on short-answer questions), Individual (students solve eight problems independently), Power (students cooperate on a multi-part problem), and Relay (students work in teams of three to solve problems using answers from the teammate ahead of them). **Deadline:** Registration packets are sent out in March; teams must be registered by early May.

Continental Mathematics League

Continental Mathematics League, P.O. Box 2196, St. James, NY 11780-0605; (516) 584-2016; Quartararo@xoommail.com; www.li.net/~majorbar/cml

CML offers four divisions for students in grades 2–12. Participants work independently, with a school's top six scores becoming its team score. All teams receive certificates and medals; national and regional awards go to top individuals and teams. **Deadline:** Schools register by October 9, 1999.

Mandelbrot Competition

Greater Testing Concepts, P.O. Box 380789, Cambridge, MA 02238-0789; (671) 661-3188; info@mandelbrot.org; www.mandelbrot.org

High school students may participate in the Mandelbrot Competition as individuals, members of a four-person team, or both. Whether they compete in the more advanced A Division or the B Division, students participate in four rounds throughout the school year. The 40-minute tests cover a variety of non-calculus topics; coaches receive a list of topics covered by the tests at the beginning of the year. **Deadline:** Register by October 8, 1999.

Sample questions from 1998 Continental Math League Meet 3, Grade 9:

1. A palindromic number reads the same forward as backward. For example, 66, 727, and 3003 are all palindromes. There are ____ more 8-digit palindromes than 7-digit palindromes.

A. no	C. 10
B. 1	D. 100

[A]

2. If $10^6 = 4^c$ x 5^d, find the sum of c + d.

[$10^6 = 2^6$ x $5^6 = 4^3$ x 5^6. 3 + 6 = 9.]

Mandelbrot Midlevels Competition

Mandelbrot Midlevels, P.O. Box 382805, Cambridge, MA 02238-2805; (671) 661-3188; contact@midlevels.org; www.midlevels.org/

Middle school students participate as individuals, part of a team, or both in three rounds distributed throughout the year. Each round is a 40-minute test based on a particular topic in mathematics. **Deadline:** Register by October 8, 1999.

MATHCOUNTS

MATHCOUNTS Foundation, 1420 King Street, Alexandria, VA 22314; (703) 684-2828; mathcounts@nspe.org; www.mathcounts.org

Continued on page 20

Living It Up at the ISEF

ebrickner-Kauffman and Jennifer Walk

Jennifer juggles tennis balls on public viewing day.

Science competitions offer awards and recognition, but are they fun? You'd better believe it! We had a blast at the 1999 International Science and Engineering Fair. There we talked to Nobel laureates and juggled tennis balls. We debated the merits of pure math and swapped stories about our hometowns. And we met hundreds of fellow students whose accomplishments and exuberance fueled our fascination with science.

The Science at the Fair

This year marked a second trip to the ISEF for both of us. Our projects varied widely from one year to the next. That's one of the great things about science fairs—they give you a chance to explore a broad spectrum of knowledge and discovery. Here's how we became finalists:

Jennifer: I had been doing science fair projects since second grade, a requirement in my gifted classes. In eighth grade, I began an extensive math project, which I eventually took to the 1998 ISEF as a sophomore. After three years on that project, I decided to try something new. So I spent part of the summer of '98 studying patterns of adult-onset diabetes in China with an epidemiologist at Cornell University. I focused on the math angle, learning SAS (a statistics programming language) and researching factors that predict diabetes and can lead to effective prevention. I turned this into a science fair project and watched it take me to the 1999 ISEF.

Taren: As a sophomore, I was required to do a science fair project. After my project on teen ethics took second place at the regional fair, I was off to the ISEF in Fort Worth, Texas. I had so much fun that I wanted to go back. This year, I focused on computer science: I developed and tested approximation algorithms for solving one of the math problems known as NP-hard—which can take astronomical amounts of time to solve, even on the most powerful computers. Less precise than algorithms, which guarantee the best solution, two of my approximation algorithms performed better than the one most commonly used for this problem (developed by mathematician Paul Erdös); two performed worse.

Once we got to the fair, we found that looking at all the other projects was as much fun as getting to display our own. The level of achievement at the ISEF is incredible, and touring the projects is like taking a crash course in modern science. The research covered all imaginable topics, from the behavior of mice to the behavior of neutrinos, from drugs that reduce stress in humans to techniques that reduce stress in buildings. Looking is a lot of fun, but the special magic begins when you start asking questions. Just get young scientists talking about something they love enough to have spent hundreds of hours working on, and all reticence vanishes. Even the shiest finalists spring to life, eager to share their hard-earned knowledge.

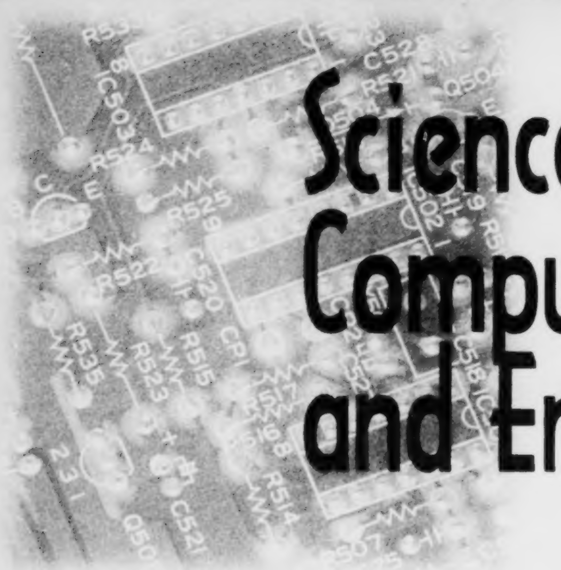
The Best Prize of All

At each ISEF, approximately one-third of the participants share millions of dollars in prize money. As returning finalists, we hoped to win something, but neither of us was expecting the big money. We weren't disappointed. We each won modest prizes, got to enjoy recognition at the awards ceremony, and now have a little extra cash to buy a computer for college or to pay for some evenings out with friends.

While prize money is certainly an incentive to participate, the emphasis of the fair is on learning and interacting. As one of our fellow finalists said, "Being here is so great that an award would just be icing on the cake." In between ceremonies and judging, we had plenty of time for exploring Philadelphia, dancing, debating philosophy with newfound friends, and soaking in all the genius around us. But the part we enjoyed most was meeting people who share our interests. Although finalists came from all over the world and had many different backgrounds, we discovered that our affinities far outweighed our differences. A love for scientific inquiry brought us together, and the fair gave us a chance to explore questions not only about science but also about ourselves and our world. And that was the best prize of all. ▼

*Born in Australia, **Taren Stinebrickner-Kauffman** (left) moved to Indiana at the age of five. She enjoys traveling, reading science fiction, and playing sports. Currently a freshman at Duke University, she hopes to become a professor of mathematics or computer science.*

*A senior at Suncoast High School in Palm Beach Gardens, FL, **Jennifer Walk** (right) enjoys coaching Academic Games teams for younger students and plans to major in mathematics when she gets to college.*



Science, Computer Science, and Engineering

ACSL Computer Science Contest

American Computer Science League, Box 40118, Providence, RI 02940; (401) 822-4312; info@acsl.org; www.acsl.org

Note: Because this contest is administered by schools, students should not contact the ACSL directly. This contact information is provided for **teachers only**; the ACSL will not respond to student or parent inquiries.

Three- and five-member teams in four divisions—Senior, Intermediate, Junior, and Classroom—compete in four contests that take place during the school year. In each contest, after responding to short theoretical and applied questions, students solve a practical problem within three days. They then test their solution on ACSL data using their school's computer facilities. The team's faculty advisor submits student responses to the ACSL. Outstanding students and schools receive prizes at the local and regional levels; top schools nationwide participate in an invitational All-Star Contest. **Deadline:** Teams must be registered by December 31, 1999.

DuPont Challenge: Science Essay Awards Program

Science Essay Awards Program, General Learning Communication, 900 Skokie Boulevard, Suite 200, Northbrook, IL 60062-4028; (847) 205-3000; www.glcomm.com/dupont/

Students in grades 7–9 (Junior Division) and grades 10–12 (Senior Division) submit a 700- to 1,000-word essay about a scientific or technological development, event, or theory that has captured their interest. In each division, the first-place winner receives $1,500; second place, $750; third place, $500; and 48 honorable mentions receive $50 each. The first-place winner in each division will be flown to Space Center Houston, along with a parent and the sponsoring science teacher. **Deadline:** Entries must be postmarked on or before January 29.

FIRST Robotics Competition

FIRST, 200 Bedford Street, Manchester, NH 03101-1103; (800) 871-8326; lbuckley@usfirst.org; www.usfirst.org

Teams of high school students work with engineers from businesses and universities to design and construct a robot within six weeks. The competition changes each year; past contests have required robots to stack inner tubes or throw balls into a goal. Most teams seek corporate sponsorship and conduct fund-raisers to finance the $4,000 entry fee and travel expenses. **Deadline:** Mid-December 1999.

1999 Philadelphia Alliance Regional F.I.R.S.T. Robotics Competition. ***Left:*** **Referees calculate points based on robots' basket height, position, and number of "floppies" collected.** ***Center:*** **Team "Mission Impossible" from Long Island, NY.** ***Right:*** **Team "Texas Torque" from Garland, TX.**

Intel International Science and Engineering Fair

Science Service, 1719 N Street NW,
Washington, DC 20036; (202) 785-2255;
www.sciserv.org/isef/index.htm

Two individuals and one team from each of 500 Intel ISEF-Affiliated Science Fairs advance to the International ISEF. These high school students compete for scholarships in 15 categories. First, second, third, and fourth place winners receive $3,000, $1,500, $1,000, and $500, respectively, in each of the 15 categories; additional awards include tuition scholarships, summer internships, scientific field trips, and laboratory equipment. The two overall winners win all-expense-paid trips to attend the Nobel Prize Ceremony in Stockholm, Sweden. **Deadline:** Check with your local ISEF affiliate, available on the Web site, for dates of local fairs.

Intel Science Talent Search

Science Service, 1719 N Street NW,
Washington, DC 20036; (202) 785-2255;
www.sciserv.org/sts/index.htm

After completing independent research projects, high school seniors submit a written description of their research and a 12-page entry form. From the 300 semifinalists, 40 finalists are selected to travel to Washington, D.C., for final judging. Ten finalists receive one of the following four-year scholarships: one $50,000, one $40,000, one $30,000, three $20,000, or four $15,000. The remaining 30 finalists each receive a $3,000 scholarship. **Deadline:** Entries are due in early December.

International Bridge Building Contest

Carlo Segre, International Bridge Building Contest, Illinois Institute of Technology, Department of Biological, Chemical, and Physical Sciences, 3101 South Dearborn Street, Chicago, IL 60616; (312) 567-3498; segre@iit.edu; www.iit.edu/~hsbridge

The goal of this contest is for individual high school students to design and construct—according to specifications that change each year—the most efficient bridge. Students advance to the international contest by placing first or second in their Regional Contest (see the Web site for recognized Regional Contests). Prizes include a four-year half-tuition scholarship to Illinois Institute of Technology for the winner. **Deadline:** Varies from late March to mid-April.

Sample problems from 1998 Physics Olympiad semifinal exam:

1. A child tosses a ball directly upward. Its total time in the air is T. Its maximum height is H. What is its height after it has been in the air for a time T/4? Neglect air resistance.

A. (1/4)H D. (2/3)H
B. (1/3)H E. (3/4)H
C. (1/2)H

[E]

2. The longest wavelength photon in the visible Balmer series for the hydrogen atom is

A. 0.66 nm D. 656 nm
B. 6.56 nm E. 6560 nm
C. 65.6 nm

[D]

International Physics Olympiad

American Association of Physics Teachers,
One Physics Ellipse, College Park, MD
20740-3845; (301) 209-3344;
aapt-prog@aapt.org; www.aapt.org/
programs/physteam/physteam.html

High school physics students begin by taking an exam consisting of 30 multiple choice questions and a creative response section. Approximately 150 of the highest-scoring students are then invited to take the three-hour semifinal exam. The top students attend a two-week Physics Camp, at the end of which five team members are selected to represent the U.S. at the I.P.O. **Deadline:** Mid-January.

National Engineering Design Challenge

Leann Yoder, JETS, 1420 King Street, Suite 405, Alexandria, VA 22314-2794; (703) 834-8867; lyoderjets@nae.edu; www.asee.org/jets/html/nedc.htm

Each year NEDC team members are challenged to design, build, and demonstrate a working model of a new product that addresses a specified social need. Schools may register any number of teams of 9th–12th graders, who must work with a teacher-coach and an advising engineer. **Deadline:** Varies by region; regional contests may be held between November 1 and January 16. Call or send e-mail to find your regional coordinator.

1998–1999 Design Challenge: Design and fabricate a device which can help an older person up from a sitting position. Your device should:

1. be portable;
2. be set up and disassembled easily;
3. be able to lift an average size older person;
4. be operable using minimal physical effort;
5. be adaptable to different chairs, seats, and couches;
6. be sensitive to the dignity of the user.

The solution or its component parts must fit through a standard door (32" x 80") and must be able to be set up in an 8' x 8' x 8' space in the display area. Solutions cannot be alive or be powered by any living thing other than the operator.

National Science Bowl

United States Department of Energy, Office of Science, 1000 Independence Avenue SW, Washington, DC 20585; (202) 586-7231; sue-ellen.walbridge@science.doe.gov; home.doe.gov/scibowl/99nsb.htm

After winning regional elimination tournaments, 53 teams of 9th–12th graders from around the country travel to Washington, D.C., to participate in this contest of rapid-fire questions on astronomy, biology, chemistry, computer science, earth science, mathematics, and physics. Past winning teams have been awarded trips to International Science School in Australia, to London International Youth Science Forum in England, National Renewable Energy Laboratory in Colorado, and Pacific Northwest National Laboratory in the state of Washington. **Deadline:** Check with your regional coordinator, available at www.doe.gov, for dates of regional contests.

National Science Olympiad

Science Olympiad, 5955 Little Pine Lane,
Rochester, MI 48306; (248) 651-4013;
gerard.putz@moa.net;
www.geocities.com/CapeCanaveral/Lab/9699

Students in four divisions—A1 (grades K–3); A2 (grades 3–6);

Continued on next page

Science, Computer Science, and Engineering

Sample toss-up questions from 1999 National Science Bowl:

Earth Science

After the silicates, the most important rock- forming minerals are the

A. sulfides C. oxides

B. carbonates D. sulfates

[B]

Chemistry

The common name of the group containing the elements Ne, Ar, and Kr is called ________ .

[Noble (or rare) gases]

Biology

Three of the four answers listed below are characteristic of meiosis. Select the exception.

A. involves two divisions

B. reduces the number of chromosomes

C. results in producing genetically identical pairs

D. produces haploid cells

[C]

B (grades 6–9); and C (grades 9–12)—may participate in the Science Olympiad at intramural, district, regional, and state tournaments; national tournaments are for divisions B and C only. These events require not only academic and problem-solving skills but also the ability to work as a member of a team. The competitions follow the format of popular board games, TV shows, and athletic games, and cover topics from biology, earth science, chemistry, physics, and computers and technology. **Deadline:** Contact your state director, available on the Web site or from the address above, for dates.

Physics Bowl

American Association of Physics Teachers, One Physics Ellipse, College Park, MD 20740-3845; (301) 209-3344; aapt-prog@aapt.org; www.aapt.org/programs/physbowl.html

High school students in two divisions—Division I (students in a first-year physics course) and Division II (students in a second-year physics course)—take this 45-minute exam that consists of 40 multiple choice questions. The top-scoring students will receive scholarships from Metrologic, Inc. **Deadline:** Late March.

Sample questions from the 1998 Physics Bowl:

1. A charged particle with constant velocity enters a uniform magnetic field whose direction is parallel to the particle's velocity. The particle will

A. speed up.

B. slow down.

C. experience no change in velocity.

D. follow a parabolic arc.

E. follow a circular arc.

[C]

2. Two isolated parallel plates are separated by a distance d. They carry opposite charges Q and each has a surface area A. Which of the following would increase the strength of the electric field between the plates?

I. Increasing Q

II. Increasing A

III. Increasing d

A. I only D. I & III only

B. II only E. II & III only

C. III only

[A]

Tests of Engineering Aptitude, Mathematics, and Science

Leann Yoder, JETS, 1420 King Street, Suite 405, Alexandria, VA 22314-2794; (703) 834-8867; lyoderjets@nae.edu; www.asee.org/jets/html/teams.htm

Schools register any number of varsity (grades 9–12) and junior varsity (grades 9–11) teams of four to eight students to participate in this two-part test: a set of multiple choice questions related to various engineering situations, and a set of open-ended questions related to some of the multiple choice items. Prizes are awarded to top-scoring teams at the local, regional, and national level. **Deadline:** Varies by region; regional contests may be held between February 5 and March 12. Call or send e-mail to find your regional coordinator.

Sample problem topics from the 1999 TEAMS:

Yogurt Factory

As a process engineer, you are responsible for designing the components required for a continuous yogurt-making process that is capable of producing 7000 liters per hour of finished product.

Bearing Performance

Your consulting firm has been hired to design a bearing to support a rotating shaft under radial loading. Among other possible designs, your team has decided to consider a journal bearing. You seek to minimize cost while meeting the customer's performance requirements.

ThinkQuest

Advanced Network & Services, Inc., 200 Business Park Drive, Armonk, NY 10504; (914) 765-1138; tq-help@advanced.org; www.thinkquest.org

Students 12–19 years old participate in this Web site design contest as members of a two- or three-person team. Team members don't have to be the same age, enrolled in the same school, or even citizens of the same country. Working with

Continued on page 20

Humanities

Sample questions from the 1999 National German Examination, Level 3:

1. Als ich in Paris ______, hat es viel geregnet.

A. gewesen	C. bin
B. sein	D. war

[D]

2. Frenzels Hund Waldi ist weg. Frau Frenzel kann ihn nicht finden und sucht uberall in der Nachbarschaft. Bei jedem Nachbarn fragt sie:

A. Gehen Sie mit Waldi spazieren?

B. Kennen Sie ein gutes Tierheim?

C. Können Sie einen Tierarzt anrufen?

D. Haben Sie unseren Waldi gesehen?

[D]

AATG Testing and Awards Program

American Association of Teachers of German, 112 Haddontowne Court #104, Cherry Hill, NJ 08034; (609) 795-5553; AATG@bellatlantic.net; www.aatg.org/stuprog.html

Second-, third-, and fourth-year German students take this 65-minute test. Some local AATG chapters award certificates, trips to summer camps in the U.S., or trips to Germany. The AATG sends approximately 60 outstanding secondary students on a four-week, all-expenses-paid study trip to Germany. **Deadline:** German teachers must order tests by October 30 for testing in December, or November 20 for testing in January.

National Council of Teachers of English Achievement Awards in Writing

NCTE Achievement Awards in Writing, 1111 W. Kenyon Road, Urbana, IL 61801; (800) 369-6283; www.ncte.org/grants/achieve.html

English departments nominate students—who must be juniors in the 1999–2000 academic year—for these awards. Each nominee offers two writing samples for judging: a timed impromptu theme written under teacher supervision and a sample of prose or verse that the student considers his or her best work. Up to 876 winners are recognized with certificates and letters of recommendation to colleges. **Deadline:** January 21, 2000.

1999 National Spelling Bee Champion Nupur Lala

National Federation of Press Women High School Journalism Contest

NFPW, P.O. Box 5556, Arlington, VA 22205; (800) 780-2715; Presswomen@aol.com; www.nfpw.org/99youth/youth.html

Students in grades 9–12 enter submissions to their state contests in editorial, feature, review, news, sports, column, feature photo, cartooning, single page layout, or graphics categories. Winners advance to nationals, where awards in each category include certificates, $100 cash for first place, and plaques for second and third place. **Deadline:** State deadlines are usually on or before February 20. Inquire at address above to find your state coordinator.

National French Contest

American Association of Teachers of French, Le Grand Concours, P.O. Box 32030, Sarasota, FL 34278; aatf.utsa.edu/concours/

To accommodate all students of French, from elementary to high school, this exam is offered at seven levels, some with subdivisions to compensate for varying backgrounds in French. Top scorers at the chapter and national levels receive prizes including French videos, books, and medals. In 1998, nine upper-level winners were offered a trip to

Continued on next page

Sample questions from the 1999 National French Contest, Level 3:

1. Avez-vous entendu parler de Marie Cassatt? _____ est un grand peintre.

A. Elle	C. Voila
B. Il	D. C'

[D]

2. On trouve les meilleurs exemples d'architecture romaine en

A. Bretagne	C. Provence
B. Anjou	D. Picardie

[C]

France by the French government. **Deadline:** French teachers must order test materials in time to administer the exam between March 1 and March 22.

National Geography Bee

National Geography Bee, National Geographic Society, 1145 17th Street NW, Washington, DC 20036-4688; (202) 828-6659; www.nationalgeographic.com/geographybee/basics.html

Students in grades 4–8 begin by competing in their school's bee. The winners at the school level take a written test; the top 100 scorers advance to the state competition. Winners of the state bees travel to National Geographic Society headquarters in Washington, D.C.; to participate in the National Geography Bee. Top prizes are scholarships in the amount of $25,000 for first place, $15,000 for second place, and $10,000 for third place.

National Geography Olympiad

National Geography Olympiad, P.O. Box 2196, St. James, NY 11780-0605; (516) 584-2016; www.li.net/~majorbar/cml

This contest, sponsored by the National Council for Geographic Education, includes five separate tests: Grades 2 (25 questions), 3–4 (35 questions), 5–6 (40 questions), 7–9 (50 questions), and 10–12 (50 questions). All tests are 35 minutes. NCGE provides recognition and awards for both individuals and teams at local and national levels. **Deadline:** October 9, 1999.

Winning questions from past National Geography Bees:

1999: The condition characterized by unusually cold ocean temperature in the equatorial region of the eastern Pacific Ocean is known by what Spanish name? [La Niña]

1998: More than 80 million people live in the European Union's most populous member country. Name this country. [Germany]

1997: Asia's most densely populated country has about three million people and an area of less than 250 square miles (402 square kilometers). Name this country. [Singapore]

National High School Essay Contest on the United Nations

John Gagain, UN Association of the United States of America, 485 Fifth Avenue, New York, NY 10017; (212) 907-1326; jgagain@unausa.org; www.unausa.org/programs/nhsessay.htm

Students in grades 9–12 submit essays of up to 1,500 words, complete with endnotes and bibliography, that respond to the year's topic. The top 10 entries from each chapter go on to Contest Finals. Awards are $1000 for first prize, $750 for second prize, and $500 for third prize. **Deadline:** Early May.

National History Day Competition

National History Day, University of Maryland, 0119 Cecil Hall, College Park, MD 20742; (301) 314-9739; hstryday@aol.com; www.thehistorynet.com/NationalHistoryDay/

Students conduct extensive research on a topic of their choice that relates to the year's theme and then present their findings in papers, exhibits, performances, or media presentations. Students in two divisions—junior division (grades 6–8) and senior division (grades 9–12)—may enter their work in one of seven categories. Approximately 100 students will win cash prizes of $500–$5,000 for superior work in a particular category; the top senior contestant will win a scholarship worth $75,000. **Deadline:** Check with your state coordinator (listed on Web site). District contests are usually held in February or March.

National Language Arts Olympiad

National Language Arts Olympiad, P.O. Box 2196; St. James, NY 11780-0605; (516) 584-2016; www.li.net/~majorbar/cml

Students in grades 2, 3–4, 5–6, 7–8, 9, and 10–12 take a 35-minute test on grade-appropriate topics including spelling, vocabulary, reading comprehension, and grammar. Top scorers are recognized at the local and national levels. **Deadline:** October 9, 1999.

National Latin Exam

ACL/NCJL, National Latin Exam, P.O. Box 95, Mount Vernon, VA 22121; (703) 360-4354; www.umich.edu/~acleague/visitors.html

Students who are enrolled in Latin or have completed a Latin course during the

Sample questions from 1999 Geography Olympiad, grades 7–9:

1. Which European country has a mountain system much like that which is a part of western Colorado?

A. Denmark	C. Portugal
B. Switzerland	D. Belgium

[B]

2. The winter solstice in the Southern Hemisphere occurs in what month?

A. March	C. September
B. June	D. December

[B]

current academic year may take the following 40-minute exams: Introduction to Latin, Latin I, Latin II, Latin III-IV Prose, Latin III-IV Poetry, or Latin V. The exam is administered in March. **Deadline:** Teachers register by January 10.

National Mythology Exam

American Classical League, Miami University, Oxford, OH 45056; (513) 529-7741; americanclassicalleague@muohio.edu; www.umich.edu/~acleague/

This multiple-choice exam includes 30 questions for students in grades 3–4; 30 questions plus 10 additional questions on the year's theme for students in grades 5–9; and an additional 10-item literary subtest for students in grades 6–9. All students receive a ribbon for participation; top scorers win special certificates and pins. **Deadline:** Teachers must register by January 15, 2000.

National Peace Essay Contest

United States Institute of Peace, 1200 17th Street NW, Suite 200, Washington, DC 20036; (202) 429-3854; essay_contest@usip.org; www.usip.org/et.html#ESSAY

With the sponsorship of any school, school club, youth group, community group, or religious organization, students in grades 9–12 submit a 1,500-word essay in response to the year's topic. State winners, who receive $1,000, receive an all-expenses-paid trip to the awards ceremony in Washington, D.C. There, the prizes of $10,000, $5,000, and $2,500 are presented to first-, second-, and third-place winners, respectively. **Deadline:** Submissions must be postmarked by January 26, 2000.

Sample questions from 1999 National Mythology Exam, Grades 5–9:

1. King Acrisius imprisoned his beautiful daughter Danae in a tower because

A. she tried to poison him.

B. she was mentally ill.

C. an oracle said her son would kill him.

D. a sibyl said she would steal his treasure.

[C]

2. The Gray sisters told Perseus where

A. the Gorgons lived.

B. the Nymphs of the North lived.

C. the King of the Waves lived.

D. the Furies lived.

[B]

Past National Peace Essay topics:

1999: Preventing Violent International Conflict

1998: Accounting for War Crimes

1997: Implementing Peace Agreements

Sample questions:

1998 Latin III-IV Prose Exam

1. Vidimus illum virum litteras scribentem.

A. to write

B. having written

C. writing

D. written

[C]

2. The Fates were portrayed as

A. women with thread and scissors.

B. birds that grab people's food.

C. monsters that wreck ships.

D. warriors armed with swords.

[A]

1998 Latin I Exam

1. In insula Sicilia sunt multi montes et _____.

A. agris C. agrorum
B. agro D. agri
[D]

2. Veni, _____, mecum ad Forum!
A. Lucius C. Lucium
B. Luci D. Lucio
[B]

National Russian Essay Contest

Jane Shuffleton, National Russian Essay Contest, Brighton High School, 1150 Winton Road South, Rochester, NY 14618; (716) 242-5051; Shuffleton@aol.com; www.actr.org/programs/olymp.htm

High school students submit essays on the year's specified topic and are judged at one of four different levels: beginner, intermediate, advanced, and native speaker. Students receive the topic at the testing site and are allowed to use their textbooks. All essays receive a gold, silver, bronze, or honorable mention award. **Deadline:** Register by mid-October.

National Social Studies Olympiad

National Social Studies Olympiad, P.O. Box 2196, St. James, NY 11780-0605; (516) 584-2016; www.li.net/~majorbar/cml

Students in grades 2–12 work independently on one of the six 35-minute multiple-choice tests that make up this Olympiad. The sum of the top 10 scores make up the team score. Each team receives a medal and certificates; individuals and teams win awards at the national level. **Deadline:** Schools register by October 9, 1999.

National Spanish Examination

American Association of Teachers of Spanish and Portuguese, 2051 Mt. Zion Drive, Golden, CO 80401; (303) 278-1021

This exam for students of teachers who are members of the AATSP is offered in three categories and at six levels to accommodate students with diverse backgrounds in Spanish. The exams include 30 each of listening comprehension and reading comprehension questions; bilingual students answer 10 additional reading comprehension questions. AATSP awards plaques to the nation's top three

Continued on page 20

R533
C528
R521
Q504
IC503
D504
R518
R524
R525
R522
C520
R535
R523
R515
CP1
2 3 1
C521
Q505

Multidisciplinary Competitions

Future Problem Solving Program

Future Problem Solving Program, 2500
Packard Street, Suite 110, Ann Arbor, MI
48104-6827; (800) 256-1499;
FPSolv@aol.com; www.fpsp.org

The Future Problem Solving Program consists of several components. In Team Problem Solving, teams of four students apply a six-step creative problem-solving process to four topics during the academic year. In Community Problem Solving, students confront and develop solutions for real-life problems within the school setting, local community, or state. Finally, in Scenario Writing, students must think critically, creatively, and futuristically as they create a "scenario," a short-short story in which one possible outcome of the future is developed through character and plot.

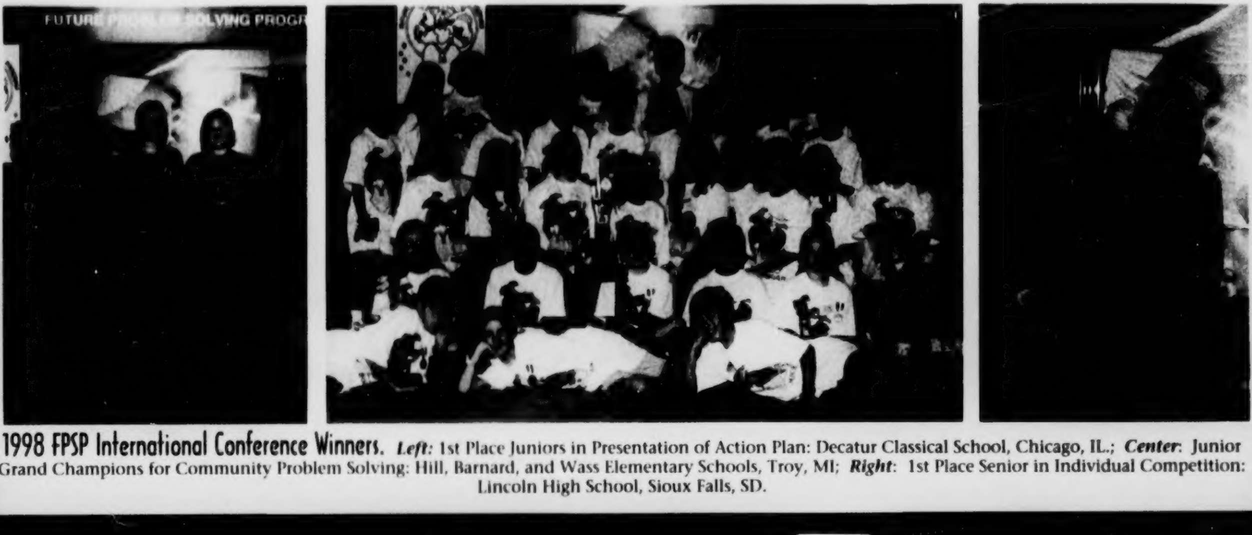
Deadline: Contact your affiliate program coordinator, available on the Web site or from the address above.

1998-99 International FPSP Conference topic: Distribution of Wealth Living standards have risen greatly during the twentieth century, but wealth remains unequally distributed, both among individuals and among nations. Attempts to reduce the disparities have sometimes had perverse results. Taking from one person to give to another may reduce the incentives of both to produce additional wealth, and in the past, money taken from poor people in rich countries has sometimes gone to rich people in poor countries. What will happen in the future?

Knowledge Master Open (KMO)

Academic Hallmarks, P.O. Box 998,
Durango, CO 81301; (800) 321-9218;
kmo@greatauk.com; www.greatauk.com

Teams of an unlimited number of middle school, junior high school, or high school students respond to 200 questions that cover 14 curriculum areas. The contest is computerized; if a team answers a question correctly the first time, they earn not only the full five points but also bonus points based on the speed with which they responded. Top teams receive plaques and t-shirts. All participants receive stickers and



1998 FPSP International Conference Winners. ***Left:*** 1st Place Juniors in Presentation of Action Plan: Decatur Classical School, Chicago, IL.; ***Center:*** Junior Grand Champions for Community Problem Solving: Hill, Barnard, and Wass Elementary Schools, Troy, MI; ***Right:*** 1st Place Senior in Individual Competition: Lincoln High School, Sioux Falls, SD.

Sample questions from the Spring 1999 High School KMO:

1. A cubic inch of matter from which source weighs tens of millions of tons?

A. protostar

B. supergiant

C. binary star

D. neutron star

E. main sequence star

[D]

2. Hank Aaron, Rosa Parks, Bill Cosby, Maya Angelou, and Colin Powell are among those who have won the

A. Oscar

B. Pulitzer Prize

C. Spingarn Medal

D. Heisman Trophy

E. Congressional Medal of Honor

[C]

certificates of participation. **Deadline:** November 24 for December 8, 1999 KMO; April 5 for April 19, 2000 KMO.

Sample Long-Term Question from Odyssey of the Mind:

EnvirOMental Challenge

The team will present a performance about an Earth species that requires atmosphere, water and land for survival and whose Home Habitat suffered disruption and is now uninhabitable. Four potential new habitats are available but whether the Earth species can live in any of them is unknown. During the performance, the team will collect samples representing atmosphere, water and land from the habitats and analyze them with a discriminating device to determine if each habitat is suitable for the species. The result of these evaluations must be communicated by a non-verbal method and displayed at each habitat.

National Academic Championship

Questions Unlimited, P.O. Box 14798, Columbus, OH 43214; (800) 868-1518; Qunlimited@iwaynet.net; www.qunlimited.com

High school teams of four students compete first at the local level, where they must win against at least eight other teams to advance to nationals. In a game-show format, teams are matched two at a time in four rounds: Warm Up, Bonus, 60 Seconds, and Stump the Experts. The winning team of the National Championship receives their choice of a vacation, cash, or Super Bowl-style rings. **Deadline:** May 20; reduced fee for registering before May 1.

Odyssey of the Mind

OM Association, Inc., P.O. Box 547, Glassboro, NJ 08028; (609) 881-1603; www.odyssey.org

Under the direction of a coach, teams of students from kindergarten through college work to solve problems with open-ended answers. Once the team has developed a solution, they present it in a performance for which they have designed and created all props and costumes. Teams also participate in a Spontaneous Round, where they receive a problem to solve at the tournament site. **Deadline:** Teams must be registered by April 1.

Quiz Bowl Tournament of Champions

American Scholastic Competition Network, 800 5th Street, Suite 125, Sioux City, IA 51101; (800) 252-4289; galco@gateway.net; www.morningside.edu/ascn/index.html

After winning their local tournament, teams of four high school students compete at the national level. At the national tournament, teams are matched two at a time for toss-up questions, team bonus questions, and team 60-second questions. The contest is triple-elimination until the field has been narrowed to 32 teams, after which it becomes single-elimination. Prizes vary each year. **Deadline:** Entries are accepted on a first-come, first-served basis until the maximum number of 64 teams is registered. The national competition takes place at the end of May.

Sample Quiz Bowl questions:

1. What famous American author put together a collection of fourteen short stories entitled *Men without Women?* [Ernest Hemingway]
2. What is the name of the opening in the exoskeleton of an insect through which air enters and gases are exchanged? [spiracle]
3. Give the exact value of each function:
   - A. cosine of 180 degrees [-1]
   - B. sine of 150 degrees [1/2]
   - C. tangent of 225 degrees [1]
   - D. cosine of 630 degrees [0]

United States Academic Decathlon

United States Academic Decathlon, 10882 Kyle Street, Los Alamitos, CA 90720; (562) 626-0092; usad@usad.com; www.usad.org

This competition tests students in 10 categories: art, economics, essay, interview, language and literature, mathematics, music, science, social science, and speech. The nine-member teams are made up of three A students, three B students, and three C students (exact GPAs listed in the USAD Study Guide). Each member participates in all 10 events. Teams compete at local, state, and national levels. **Deadline:** Students may request study guides in May; teams should be formed by October. Contact your state director, available on the Web site or from the address above, for dates of local contests.

United States Academic Triathlon

United States Academic Triathlon, P.O. Box 1765, Minnetonka, MN 55345; (612) 962-4534; psheldon@stthomas.edu; tigger.stthomas.edu/edsl/USAT/

Continued on page 21

NATIONAL HISTORY DAY: Leaving t

by Fernan Tolentino

For five days this June, 2,000 students in grades 6 through 12 came from 48 states and the District of Columbia to the University of Maryland to compete in the 20th annual National History Day. Through live performances, documentaries, papers, and exhibits, competitors presented 2,000 different ways of addressing a single theme: "Science, Technology, Invention in History: Impact, Influence, Change." Projects on topics as varied as food preservation, the polio vaccine, the Manhattan Project, and barbed wire all demonstrated how technology has changed the world.

Our writer surmounted an unusual obstacle to become a national finalist. A native of the Philippines, he arrived in California at the age of 10 unable to speak, read, or write in English. His fellow fifth graders teased him for being different, but he forced himself to speak to them—and spent many hours at home learning the intricacies of their language. Soon after he had mastered English, he began entering History Day competitions, where he met with mixed results.

A Checkered Past

My first two attempts at History Day were disastrous. All seventh and eighth graders at my school were required to do History Day projects for history class. In seventh grade, I chose to do an individual exhibit on Galileo. As someone raised Catholic but not very knowledgeable about Church history, I was intrigued by his conflict with the Catholic Church. That year, and again in eighth grade when a friend and I did a group exhibit on the Vietnam Era's anti-war movement, I put countless hours of work into research and design. I thought lots of source materials and an attractive display would add up to a winning entry. I was

Currently a senior and the associated student body president at Valley High School in Sacramento, CA, Fernan Tolentino enjoys theater class, singing in choir, hanging out with friends, and dreaming of a career as an elected official.

e Textbooks Behind

wrong. I didn't even make it to the district level.

Those frustrating defeats nearly led me to give up on History Day when I got to high school. I wanted to learn more about European and American history as I tried to understand my adopted homeland, but I thought History Day just wasn't for me. When two friends invited me to join them in their group exhibit on Marie Curie, I hesitated. But Mr. Myron Piper, our History Day coach, encouraged me to try. He also made sure we had the proper display panels, mat boards, story, and bibliography. Standing next to our exhibit at state finals, I knew I'd made the right decision.

In sophomore year, I asked three of my classmates to work on a project investigating the migration of the Ahwaneechee, or Yosemite Indians, of California. This was probably the most fascinating project I've ever done. Forced by European settlers to make numerous migrations during the mid-nineteenth century, the tribe was scattered by starvation, in-fighting, and the death of their leader. Now, their descendants must pay to use their ancient sacred lands within Yosemite National Park for yearly rituals. When our exhibit made it to nationals, my group took the opportunity to visit the tribe's representative in D.C.

Going Solo

Our trip to nationals was a great thrill, and our project took third place in the exhibit category. That's why I was stunned when my group mates said they didn't want to enter History Day again. Although I knew it meant a lot of hard work, I decided to go it alone in '99. To address this year's theme, "Science, Technology, Invention in History," my advisor suggested that I do a project on tractors. I soon discovered that this was a huge topic and so narrowed my focus to the steam tractor in California. I became fascinated by this machine that revolutionized agriculture in America and turned my home region, the San Joaquin Valley, into a major source of revenue and food for the entire West Coast.

On a visit to Davis, one of California's historic farming communities, I saw real steam tractors and met with a collector who lent me tractor parts to use as display artifacts. The corrugated tin roofs of the

Continued on page 26

▶ *Mathematics–from page 8*

MATHCOUNTS holds competitions for 7th and 8th graders at the school, chapter, state, and national level. Winners of the approximately 500 chapter meets progress to state contests held in March; the top four scorers and top coach in each state earn an all-expense-paid trip to Washington, D.C., for the national finals in May. **Deadline:** Schools register by January 8, 2000.

Sample problems from the 1999 National MATHCOUNTS:

1. What is the sum of all positive two-digit integers with exactly 12 positive factors? [402]
2. The product of two integers minus their sum is 39. The integers are relatively prime, and each is less than 20. What is the sum of the two integers? [16]

U.S.A. Mathematical Talent Search

Dr. Gene A. Berg, D5/MEPP, National Security Agency, 9800 Savage Road, Fort George G. Meade, MD 20755-6217; (310) 688-3175; gaberg@ieee.org; www.nsa.gov:8080/programs/mepp/usamts.html

A contest for high school students, the USAMTS consists of four five-problem rounds. The problems are published on the Web site, and students have four weeks to prepare their solutions. Students can earn up to 5 points for each solution, potentially accumulating 100 points during the school year. Participants who have scored 71 or more after three rounds will be invited to take the AIME. **Deadline:** Each round has a mailing deadline, which is published with the problems on the Web site. ▼

Sample USAMTS problem:

Use each of the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 exactly twice to form distinct prime numbers whose sum is as small as possible. What must this minimal sum be? (Note: The five smallest primes are 2, 3, 5, 7, and 11.)

[Clearly 4, 6, and 8 cannot occur in the units digit. Similarly, 2 and 5 may occur in the units digit at most once. Thus the sum must be at least $2(4 + 6 + 8)10 + (2 + 5)10 + (2 + 5) + 2(1 + 3 + 7 + 9) = 477$. To see that 477 can indeed be attained, we first note that the only two primes in the 80s are 83 and 89, and that the only two primes in the 60s are 61 and 67. This leads us to the solutions:

$2+ 5+ 23+ 41+ 47+ 59+ 61+ 67+ 83+ 89 = 477$

$2+ 5+ 29+ 41+ 47+ 53+ 61+ 67+ 83+ 89 = 477$]

▶ *Science, Computer Science, and Engineering–from page 12*

ThinkQuest continued

as many as three coaches, these teams submit an entry in one of five categories: Arts & Literature, Science & Mathematics, Social Sciences, Sports & Health, and Interdisciplinary. Winning teams share scholarships and cash awards totaling over one million dollars. A similar program for students in grades 4–6, ThinkQuest Junior, was started this year. Prizes include a total of $200,000 in cash, computers, and networking resources. **Deadline:** Applications due in March.

U.S.A. Computing Olympiad

USACO, University of Wisconsin–Parkside, Box 2000, Kenosha, WI 53141-2000; (414) 595-2231; piele@cs.uwp.edu; www.uwp.edu/academic/mathematics/usaco.htm

Based on their performance in the Fall, Winter, and Spring Opens (Internet contests) and the National Championship (a five-hour proctored competition), 15 high school students—who must have Internet access to compete—will be selected to attend the USACO Olympiad Training Camp. Four of these students will then become members of the U.S. team that participates in the International Olympiad in Informatics. **Deadline:** Students should join the competition in September.

U.S. National Chemistry Olympiad

American Chemical Society, Education Division, 1155 16th Street NW, Washington, DC 20036; (202) 872-4600; www.acs.org/education/studprog/olympiad.html

Only two students per high school—selected on the basis of scores on qualifying exams or other screening methods—may sit for the four-and-one-half-hour USNCO national exam. The exam consists of a 90-minute, 60-item multiple choice section; a 105-minute, eight-question free-response section; and a 75-minute, two-item laboratory practical. The top 20 scorers on this exam attend a two-week study camp, where the four students who will attend the International Chemistry Olympiad are selected. **Deadline:** Chemistry teachers must order local-section tests by early February; local tests are administered between early March and early April. ▼

Sample questions from the 1999 U.S. National Chemistry Olympiad, Part I:

1. When ionic hydrides react with water, the products are

A. acidic solutions and hydrogen gas.

B. acidic solutions and oxygen gas.

C. basic solutions and hydrogen gas.

D. basic solutions and oxygen gas.

[C]

2. The decomposition of ethane into two methyl radicals has a first order rate constant of 5.5×10^{-4} sec^{-1} at 700°C. What is the half-life for this decomposition in minutes?

A. 9.1 C. 21

B. 15 D. 30

[C]

▶ *Humanities–from page 15*

National Spanish Exam continued

scorers, and many chapters award additional prizes. **Deadline:** The exam may be administered between February 15 and March 15. Check with your teacher or local coordinator for registration dates.

Olympiada of Spoken Russian

American Council of Teachers of Russian, 1776 Massachusetts Avenue NW, Suite 700, Washington, DC 20036; (202) 833-7522; hsape@actr.org; www.actr.org/programs/olymp.htm

The Olympiada provides a forum for U.S. high school students of Russian to demonstrate excellence in the language and to test their knowledge of spoken Russian in open competitions. Each participant receives a different topic, which might relate to the history, geography, music, literature, or art of Russia. Medalists are recognized in awards

Sample questions from the World History Contest of the National Social Studies Olympiad, grades 10–12:

1. Vasco da Gama differed from Christopher Columbus in his search for a route to Asia in that da Gama

A. sought an all-water route through the Black and Caspian Seas.

B. traveled overland across Russia.

C. retraced the route used by Marco Polo.

D. sailed eastward around the southern tip of Africa.

[D]

2. John Locke wrote the *Two Treatises on Civil Government* to

A. support the right of all English citizens to vote for Parliament.

B. oppose Cromwell's execution of King Charles I.

C. support the right of Americans to rebel against the English king.

D. oppose absolute monarchy in England.

[D]

assemblies in their respective schools; teachers are commended by their school districts; and the top students in each region (the gold medalists) are invited to take part in a summer immersion program in Russia under ACTR sponsorship. **Deadline:** Registration deadlines are set by state/regional coordinators.

Scholastic Art and Writing Awards

The Scholastic Art and Writing Awards,
555 Broadway, 4th Floor, New York, NY
10012; (212) 343-6493;
GeneralInfo@Scholastic.com;
www.scholastic.com/artandwriting/

More than 1,000 awards—including cash, scholarships, certificates, and exhibition or publishing opportunities—go to the national winners in sixteen visual arts and nine writing categories. The contest is open to students in grades 7–12. **Deadline:** Contact your regional sponsor; some require submissions as early as November.

Scripps Howard National Spelling Bee

National Spelling Bee, Scripps Howard, P.O.
Box 371541, Pittsburgh, PA 15251-7541;
(513) 977-3040; bee@scripps.com;
www.spellingbee.com

Students in 8th grade or below progress to the National Spelling Bee after winning one of the 239 bees sponsored by daily or weekly newspapers. All spellers at the National Bee receive cash prizes ranging from $50 to $10,000 depending on the number of rounds successfully completed; the winner receives several additional prizes. **Deadline:** Check with your local sponsoring newspaper.

Past winning words:

1999: logorrhea

1998: chiaroscurist

1997: euonym ▼

▶ *Multidisciplinary–from page 17*

U.S. Academic Triathlon continued

Teams of 5th- and 6th-graders, 7th- and 8th-graders, and high school students compete in a season of three round-robin events and may advance to regional playoffs and state tournaments. Each meet consists of three events. P.A.R.T.Y. (Planning, Assembly, and Re-enactment Theater is Yours) in a Box requires students to demonstrate their solution to the provided scenario. Mind Sprints challenge students—as individuals or teams—to solve several short problems in a set time. Face-Off! matches three teams at a time to answer questions covering several academic areas. **Deadlines:** Grades 9–12, register by September 15. Grades 5–8, register by November 19. ▼

Sample U.S. Academic Triathlon Mind Sprint, 1998 Round Robin, grades 9–12:

Diorama: Do you remember having to make a diorama as a kid? You might have had to create an Indian village, show the Boston Tea Party, or make a volcano eruption.

Use the provided items in your competition kit to build a diorama of your team's interests and hobbies. You have nine minutes, beginning now, to create your diorama.

Sample questions from Face-Off!, 1999 state tournament, grades 7–8:

1. Which engine is most fuel-efficient: electric, gasoline, diesel, or creosote? [electric]

2. Name as many U.S. state capitals as you can that are named after U.S. presidents. [Jackson, MS; Jefferson City, MO; Lincoln, NE; Madison, WI]

Sample questions from the 1999-2000 Academic Decathlon practice booklet:

Music

How does vocalese differ from scat?

A. Vocalese are previously played instrumental lines with words added while scat solos are improvised.

B. Vocalese is done by a single person while scat solos are done in groups.

C. Vocalese is improvised while scat solos are previously played instrumental lines with words added.

D. Vocalese can be performed by singers and instrumentalists while scat only applies to singers.

E. There is no difference between vocalese and scat.

[A]

Social Science

In the future, people inevitably will be learning to rely far less on fossil fuels, and instead may turn to nuclear energy, or other cleaner, more renewable sources of energy. If this occurs, the need for which two global infrastructure projects will be lessened MOST dramatically?

A. Alaska Pipeline and Suez Canal

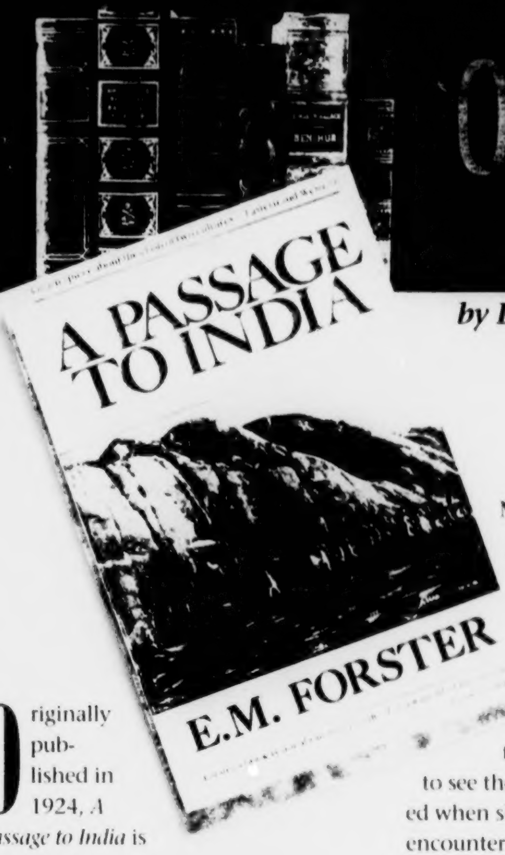
B. Transcontinental Railroad and Three Gorges Dam

C. Hoover Dam and Glen Canyon Dam

D. Chunnel and Alaska Pipeline

E. ISS and Panama Canal

[A]



OFF THE SHELF

by Diane Clavier

Originally published in 1924, *A Passage to India* is set in contemporary India, which had been under British rule for 200 years. Although English readers accused Forster of stereotyping the British in India, the believable and idiosyncratic characters are actually one of the novel's greatest achievements. But the book is most memorable for its less tangible qualities. Characterization, plotting, and political commentary form a solid framework for a profound exploration of how the individual spirit dwells within a society that can both nurture and cripple.

The novel opens by introducing the central character, a Muslim doctor named Aziz. He's an excitable, passionate man with unusual surgical skill and a great love of nostalgic poetry. As evening falls, he enters a ruined mosque where he meets Mrs. Moore, an elderly woman newly arrived from England who has taken the time to remove her shoes. Her explanation for this rare courtesy, "God is here," surprises Aziz. The two begin an intimate conversation. Charmed by her respect for both him and his religion, Aziz quickly decides that she is someone special.

Mrs. Moore's traveling companion and future daughter-in-law, Adela Quested, shares her open-minded outlook. She is an educated and sensible person who cannot understand the British contempt for the people of India. She yearns to see the "real" India, and is fascinated when she learns about Mrs. Moore's encounter with Aziz. Yet India eludes her and soon her yearning wanes. By the time she actually gets a taste of India, on a visit to the mysterious and alluring Marabar caves, she learns that "life never gives us what we want at the moment we consider appropriate." Like many events in this novel, her visit is disappointing because it comes at the wrong time.

Adela's experiences at the caves form the central episode of the novel. The uncanny echo of these ancient hollows turns everything—from a cough to the profoundest of statements—into the same rushing boom. For Mrs. Moore, this sound declares the meaninglessness of all human beliefs and endeavors. Adela is unmoved at first, but when she enters a second cave alone, she becomes disoriented and terrified. Because she cannot understand what has happened, she confuses it with a physical assault, for which her unfortunate host, Aziz, is arrested. This destroys his respect for the English and ends his friendship with both Adela and Mrs. Moore.

The most significant result of Adela's delusion is the growth and near destruction of the relationship between Aziz and his British friend Fielding. After Aziz's arrest, the cool-headed and sympathetic Fielding offends his own compatriots by siding with Aziz. But, later, when Adela (whom Aziz considers his "enemy") is left friendless, his deeply ingrained English chivalry compels him to help her. Although Fielding continues to care more for Aziz, the young doctor feels betrayed. To justify his feelings, he concocts a wild story about Fielding based on rumors and misinterpretations. Although the two men finally get at the truth, their efforts to connect have been frustrated by their very different customs and senses of propriety.

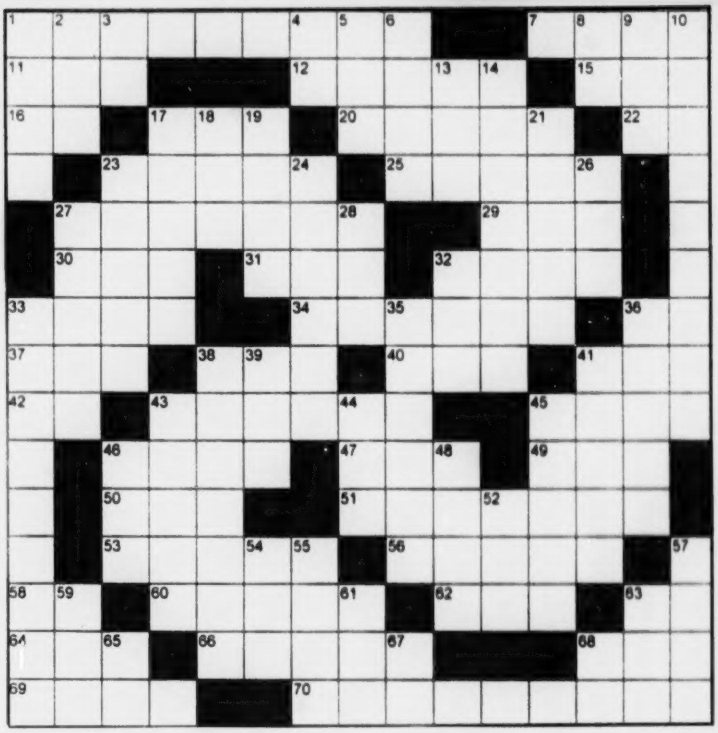
Forster suggests that such disappointments are an inevitable part of living within cultural constraints. Nevertheless, *A Passage to India* celebrates culture and cautions against life without it. The characters who, by accident or design, become detached from their cultural moorings are the ones who suffer most. On the other hand, both Aziz and Fielding find comfort and meaning by turning to their own traditions and values. All of Forster's novels examine how we're limited by society and circumstance, but his last and greatest work recognizes this important paradox: culture can stifle us, but it's also a vital part of who we are. ▼

Upcoming Book Review:

A Distant Mirror: The Calamitous 14th Century by Barbara W. Tuchman

Word Wise: NOBEL LAUREATES

by Carol Blackburn



ACROSS

1 1973 Nobel Peace Prize recipient whose cowinner refused his Nobel Prize

7 Poet

11 Annoy

12 Niels Bohr won the 1922 Nobel Prize for Physics for his investigations of the structure of ______

15 ___ *culpa*

16 Canadian prov.

17 Airlines watchdog agency

20 Two-time Nobel laureate, in Physics and Chemistry

22 Deciliter (abbr.)

23 See 9 Down

25 Farms

27 Two-time Nobel laureate, in Chemistry and Peace

29 Three, to Tertius

30 Muhammad __

31 Bride of Christ

32 Sean Connery, for ex.

33 Extremist religious group

34 Source of the sun's energy

36 Yo-Yo ___

37 Graft-rejection antigens

38 Hebrew "C"

40 Lodge

41 Surface-to-air missile (abbr.)

42 User interface (abbr.)

43 One of only two U.S. Presidents to be awarded the Nobel Peace Prize

45 House, in Honduras

46 Native of northern Scandinavia

47 Mature

49 Hoopla

50 Young woman

51 1965 Nobelist in Physics for his theory of quantum electrodynamics

53 Prufrock's creator and winner of the 1948 Nobel Prize for Literature

56 Refute

58 __ only

60 Entrap

62 Scandinavian airline

63 Greek "M"

64 __ Gehrig

66 Dignified

68 Facial muscle spasm

69 Rita __-Montalcini, 1986 Nobelist in Medicine and Physiology

70 1958 Nobel Prize winner for Literature who was forced by his government to decline the prize

DOWN

1 US civil rights leader and 1964 Nobel Peace Prize winner

2 Tax agency

3 Canadian prov.

4 Atlanta locale

5 And so forth

6 Trounce

8 Morning

9 With 23 Down, three-time Nobel Peace Prize recipient (2 wds.)

10 Spiritual and political leader of his nation since he was 15 and 1989 Nobel Peace Prize recipient

13 Brain scan

14 Semiconductor

17 Forbidden __

18 Major internet service provider

19 "It's _ __ to kill a mocking bird." (2 wds.)

21 Gertrude ___, 1988 Nobelist in Medicine and Physiology

23 Kind of lily

24 Puts out

26 Pose

27 1945 Nobelist in Physics for his discovery of the Exclusion Principle

28 Wildebeest

32 Transgression

33 The only head of state ever to win the Nobel Prize for Literature

35 Isaac Bashevis ____, 1978 Nobelist for Literature

36 _____-Dixon

38 Kim's creator and 1907 Nobelist for Literature

39 Mountain

41 1978 Nobel Peace Prize winner who was later assassinated

43 Van der __, 1910 Nobelist in Physics

44 Klutz

45 WW II resistance fighter who received the 1957 Nobel Prize for Literature

46 Size (abbr.)

48 Sensory organs

52 Athletic association

54 Paddle

55 "The Parent __"

57 Winner of the 1938 Nobel Prize for Literature for her "rich descriptions of peasant life in China"

59 Enemy

61 __ Braun

63 Missing soldier

65 High-energy radiation

67 It (Ger.)

68 The Volunteer State

Solution on page 31

Exploring Career Options: Business Consulting

Interview with Emily Linklater

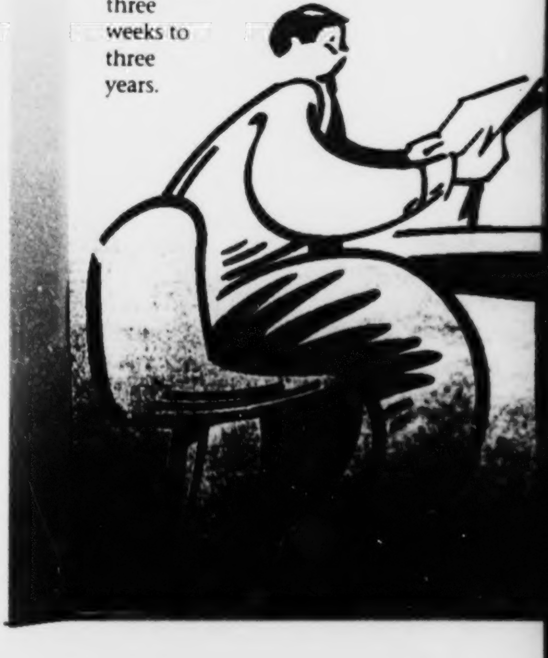
by Diane Clavier

After completing a degree in Government and International Studies at the University of Notre Dame, Emily Linklater wondered what was next. Her love for sports led her to a two-year job as an account executive for a major sports team, but she wasn't completely satisfied, and so decided to go back to school for a graduate degree in business. While interviewing at the Kellogg Graduate School of Management, she learned about the opportunities offered by the consulting firm of Arthur Andersen. She looked into the field and discovered that it would perfectly suit her energetic personality and entrepreneurial drive. Setting aside her plans for more school, she decided to plunge into the fast-paced world of business consulting—and has never looked back.

What is business consulting?

We help businesses do business better. We work with companies who either have a problem, like high operating costs, or want to make a change, like setting up a Web site to sell their products. Many companies lack either the manpower or the experience to research and execute necessary or desired changes. So they come to us because we've dealt with those exact same issues before.

We work with nearly every kind of business from hospitals and grocery stores to banks and universities, and we help them with everything from upgrading their computer networks to training their employees to use them. We go into companies and tackle these projects that can last anywhere from three weeks to three years.



> We work with nearly every kind of business from hospitals and grocery stores to banks and universities, and we help them with everything from upgrading their computer networks to training their employees to use them.

What kinds of projects do you work on?

I work as part of a group that focuses on manufacturing companies. I'm building expertise in what we call "Go-to-Market" strategies. This means that I help companies develop long-term plans that will allow them to achieve their goals, like making a profit or finding the most effective means of getting their products to customers. In order to help companies achieve these large goals, I usually have to address specific problems. For example, I'm currently working with a company that is adjusting its operations: they've doubled their customer base and have begun using outside vendors to provide services they once provided directly. I've been upgrading the billing function of their computer system to accommodate this change. My job includes designing, implementing, and testing the new billing system.

How do you get started on such a project?

I had to begin by figuring out which parts of the company's operations are affected by the current system. This kind of analysis is crucial to any consulting job because whenever you redesign some aspect of operations, you could be changing somebody's job or increasing the cost of staying in business. So no matter how small a piece you're working on, you have to take a comprehensive view of the company: what goes on within the company, what's going on in the industry, and what changes might affect how the company operates. If all these factors aren't taken into consideration, even the most carefully developed plans can *cause* rather than solve problems. For example, I might design a great billing system, but if staff or customers have to make major changes to accommodate my system, or if it costs twice as much to use, I haven't helped my client.

Is this kind of analysis something you learn on the job?

Well, consultants certainly develop these skills through working with clients. But it is also a primary focus of Arthur Andersen's training course, which taught me more in three weeks about how businesses work than I learned in two years at my marketing job. Apart from the finance and economics lessons, which have been a great help to me, the course taught me a useful approach to organizations. I learned to analyze all the pieces of a company (everything from how products are made to how decisions are made), how those pieces fit together to form a whole, and how they relate to people outside the organization like competitors, investors, and customers. All in all, the training was fabulous.

Has your college major been an asset to you as a consultant?

It helped me to develop skills in analysis and communication. I did a lot of research, wrote a lot of papers, and learned how to synthesize information and express ideas clearly. I use those skills every day. But what I have found equally useful is the respect it gave me for lots of people's ideas. While discussing problems and strategies with others, I'll often hear an idea that I think is crazy at first, but it turns out to be the best idea—and better than anything I could have envisioned. One person is bound to miss something. But three or four people can find a comprehensive answer. And I love this team approach.

What else do you enjoy about your work?

When I was looking for a job, I wrote down some essential criteria. I wanted to do tasks that I found challenging and interesting. I wanted to work for a company that would offer training and opportunities for career growth. I wanted to work with interesting, well-rounded

Continued on next page

▶ *Exploring Career Options—from page 25*

people. I have found all of those things here—and haven't been expected to sacrifice my personal life to achieve and grow within the company.

But best of all, I enjoy what I do every day. It's always new, and I love knowing that the decisions I make, the information I gather, and the ideas I develop all have an impact on both my clients and my company. It's up to me to make a positive impact—and that engages both my intellect and my creativity.

What path did you take to get from college to your present career?

When I graduated from college, I had no idea what I wanted to do. I had many interests, but I couldn't point to one thing that I wanted to devote all my time to. About a year after I graduated, I started to list all of my interests. I thought if was going to spend 40 hours or more a week doing something, I should enjoy it. One interest that kept surfacing was sports. So I worked in sports marketing for a while, but found that it wasn't right for me.

Once again, I began listing what I wanted from a job. I also asked anyone who would talk to me questions like, "What do you do every day? What do you like or dislike about your job?" I soon realized that you can tell a lot by whether or not people want to discuss their jobs. If not, it probably means they're sick of doing it all day and want to focus on something else. But if they like it, then they'll talk about it. Along the way, I became interested in consulting. When I was offered the chance to jump right into the field without a graduate degree, I took it. And I'm glad I did.

What direction would you like your career to take?

I can see myself staying with Arthur Andersen for a very long time. I'd like to continue specializing in business strategies but move toward working with companies that have a more international focus. I've always been interested in foreign languages and cultures and in international affairs. I'd also like to continue developing my expertise in finance, which reflects my early interests in mathematics—a major I initially considered when I entered college. I want to develop my career in a way that will allow me to pursue interests I had when I first started college.

Looking back on the decisions that you made in school, is there anything you would have done differently?

I've always tried to base decisions on criteria that suited my own needs and dreams. I consider that to be crucial, so I wouldn't have done anything differently. But I've learned that when you have interests and skills in many areas, it can be hard to choose a direction. The advice I heard most often when I was in school was "focus, focus—as soon as possible—focus on something." But I think that when you're young, you should be concerned with developing many interests while you have the time—and discovering, through exploration, what truly suits you. Only then should you focus. I learned that not only in college, but also in my work. Arthur Andersen offers many possible career paths and we're encouraged to be generalists and learn as much as we can before selecting an area of expertise. Over time, one or two choices begin to stand out as more prominent; then we're able to make informed decisions about where our focus will lie.

And do you feel that many possibilities await you?

Yes. One of the best things about a career in consulting is that it is what you make it. For the first time in my professional life, I feel that I know what I'm doing and why I'm doing it. That's essential to satisfaction in any job. My field offers countless ways to develop and tailor-make a career. I can't envision any greater opportunity. ▼

▶ *National History Day—from page 19*

tractors inspired me to use corrugated tin for my display boards. These elements, combined with vintage photos, a plexiglass case for the artifacts, and a carefully crafted story, made a unique exhibit that took first place in the district, county, and state. In June, my chaperone and I were on our way to the University of Maryland!

Judgment Day

Since I was all alone, I felt self-conscious about introducing myself to the other participants in my dorm. But they were so friendly that I found I could easily talk to anyone. By Sunday night, I had made a group of friends from Indiana and Vermont. We hung out together for the rest of the week, spending hours talking, laughing, forming impromptu parties, and staying up late.

My new friends and I had so much fun that I hardly regretted having stayed up with them until 3:00 Tuesday morning, eight hours before facing the senior division judges. After sleeping for a few hours, I got up to review my notes, story, and bibliography. The previous year, my group had been grilled heavily, and I expected the same this year. So I was surprised when the judges spent the minimum requirement of five minutes with me, complimenting my display and asking me questions like, "Do you want to be a curator?" and "Where did you get your artifacts?"—but no topic questions. When the interview was over, I felt relieved—and exhausted. I went back to my room and slept for hours.

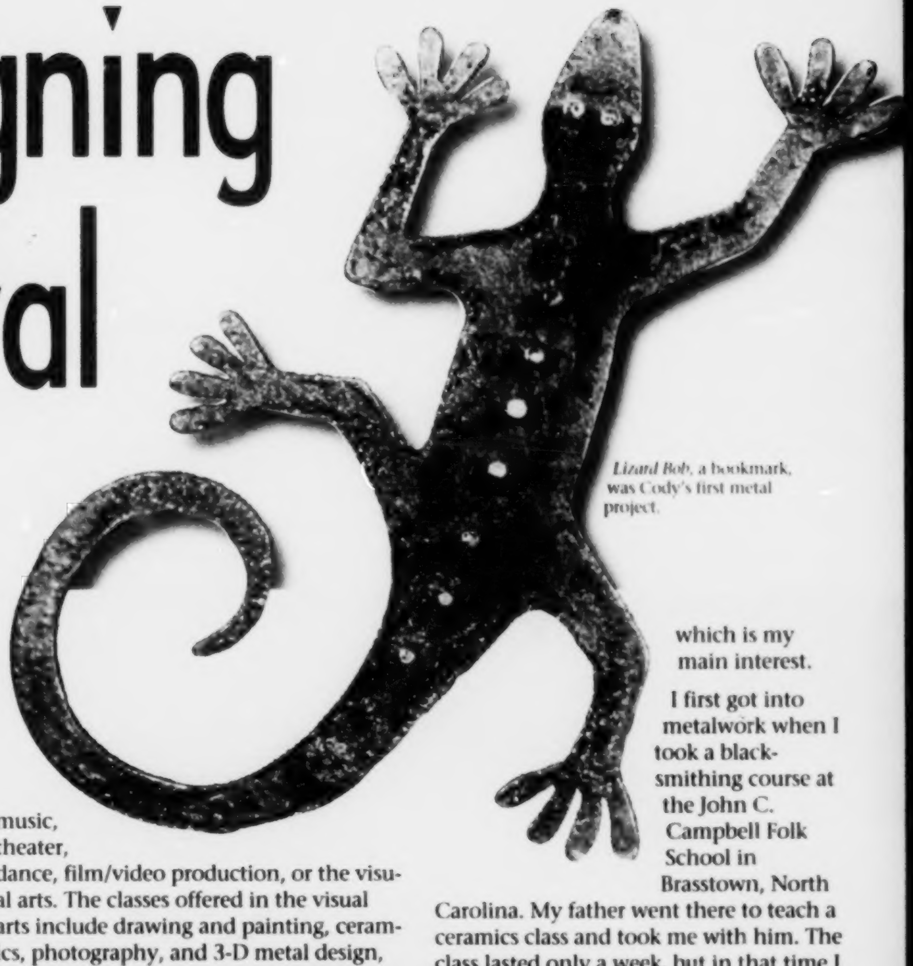
During the Awards Ceremony on Thursday morning, I found out that my exhibit had been named the outstanding entry of all categories from the State of California. I was pleased with the results of the judging, but I felt sad because it was time to ieave.

It was hard for me to say goodbye to my friends. We hope to see each other at next year's nationals, but in the meantime, by phone and e-mail, we are still finding reasons to stay up too late and laugh at each other's jokes. ▼

For more information about National History Day, see page 14.

Designing in Metal

by Cody Chance



Lizard Bob, a bookmark, was Cody's first metal project.

Each year, 250,000 students in grades 7–12 submit their work in writing and the visual arts to the Scholastic Art and Writing Awards. About 30,000 of these entries advance to national judging. This year, Cody Chance's entry in the Jewelry and Metalsmithing category, a mixed media box construct, made it to nationals. This piece ultimately won a Pinnacle Award, which is given to one outstanding piece in each of the 16 visual arts categories. With the other award-winning works, Cody's entry was put on display at The Corcoran Museum of Art in Washington, D.C.

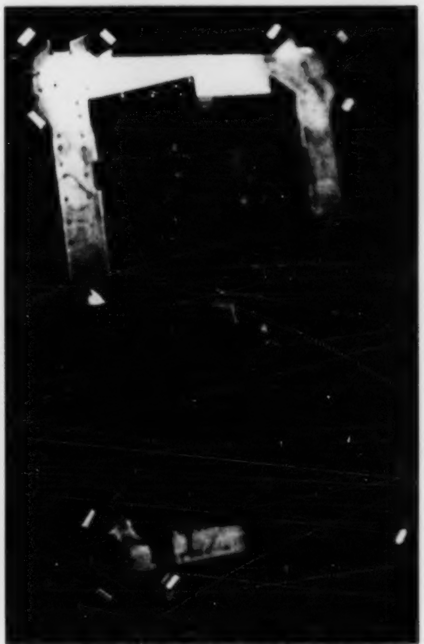
In this article, Cody shares the experience of discovering metalsmithing and of creating his award-winning piece.

I think that my interest in art is a matter of fate. My father dropped out of medical school to become a potter, and my parents met when my mother took a class he taught at the county museum. I suppose creativity is in my blood, and my parents have always encouraged me to pursue art.

Growing up, I always considered myself artistically talented, but I never took the idea of actually *being* an artist very seriously until last year when I was accepted to the Fine Arts Center. There, a whole new field of art opened up for me.

Educating the Artist

The Fine Arts Center in Greenville, South Carolina, is a magnet school for the arts. Students attend their home high school for half of the day and spend the other half at the Fine Arts Center working on music, theater, dance, film/video production, or the visual arts. The classes offered in the visual arts include drawing and painting, ceramics, photography, and 3-D metal design, which is my main interest.



Reliquary won the Pinnacle Award for Jewelry and Metalsmithing in the 1999 Scholastic Art Awards.

I first got into metalwork when I took a blacksmithing course at the John C. Campbell Folk School in Brasstown, North Carolina. My father went there to teach a ceramics class and took me with him. The class lasted only a week, but in that time I developed a real taste for the smell of coal smoke and beating on red-hot metal. I also developed a really sore right arm, but I was hooked, and when I had the opportunity to do more metalwork at the Fine Arts Center, I jumped at it.

Italy in a Box

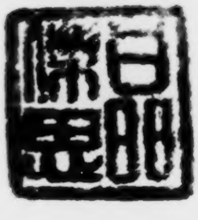
My very first metal piece at the Fine Arts Center was a bookmark in the shape of a lizard, a thing I called *Lizard Bob. Lizard Bob* took me about a week and a half to complete. My next piece, *Reliquary*, took me the rest of the semester to complete.

Reliquary is a reflection on last summer, which I was lucky enough to spend in Italy. Reliquaries, ornate containers used for storing and displaying relics, such as the hair and bones of saints, are commonly found in Roman Catholic churches in Europe. I saw many of them in Italy, and the form really excited me—in part because these exquisitely beautiful pieces of art served such a morbid practical pur-

Continued on page 35

Discovering My Chinese Self:
Lessons in Brush Painting

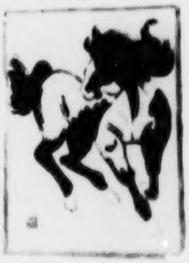
by Jessica Kinloch



Above: Jessica's Chinese name appears on all of her brush paintings. ***Right:*** Jessica's very first Chinese brush painting.

When my family began planning our first trip to China, I was overjoyed. You see, although I am half Chinese, I was woefully ignorant of my roots. For starters, I do not speak or understand Chinese. It seemed as if my only appreciation of the Chinese culture was the food! I prepared myself for the trip by reading about China, looking at photographs, and, most of all, by studying Chinese brush painting.

Wolf Hair and Rice Paper



I have always admired the Chinese brush paintings—one depicting the misty hills of Quilin and one of two horses—at my grandparents' house. When I decided that I wanted to take a course in Chinese brush painting at UCLA, I showed my grandparents a course description. Noticing that the teacher was the son of a painter famous for his brush paintings of horses, they encouraged me to sign up.

At the first class, the teacher explained the painting materials to us. We would be using several brushes of different sizes, each with a different type of hair: sheep, wolf, horse, even rooster! Varying in absorbency, stiffness, and roughness, each type of hair creates a different effect. We would be painting on *shuen* rice paper, which is incredibly thin and absorbent, allowing full depth of shading, even in a painting of few strokes. But this texture allows no room for mistakes. There is always the danger of extra water leaking onto the paper and smearing the paint. This is why each stroke must be fast and fluid.

As I toiled at the initial "tear drop" exercises, I began to see that brush painting requires great patience and practice. I felt that I had no control of the brush, which must be held at the very top, instead of close to the bristles, to allow for freedom of movement and bold strokes. Even a simple-looking painting, I discovered, requires extraordinary amounts of vision and technique. I was intrigued.

On the Yangtze River

Soon after I finished the brush painting class, my family and I embarked on our trip to China. I traveled all over and met my relatives in China for the first time. I visited the Great Wall, imagining what it must have been like to work for years building it, and sailed on the Yangtze River. On that cruise, I noticed a Chinese painter on board. As passengers eager for a beautiful souvenir of their trip bought his paintings, I thought to myself, I can do that!

> Even a simple-looking painting, I discovered, requires extraordinary amounts of vision and technique.

We found an art store in Shanghai, where I was delighted to buy several brushes, paper, and chip colors (which are made naturally from vegetable and plants). I also bought ink sticks and a grinding stone, rather than bottled ink. Of course, I was still a novice and did not fully understand what I was getting into. But I was excited to have genuine Chinese brush painting materials to take back home with me.

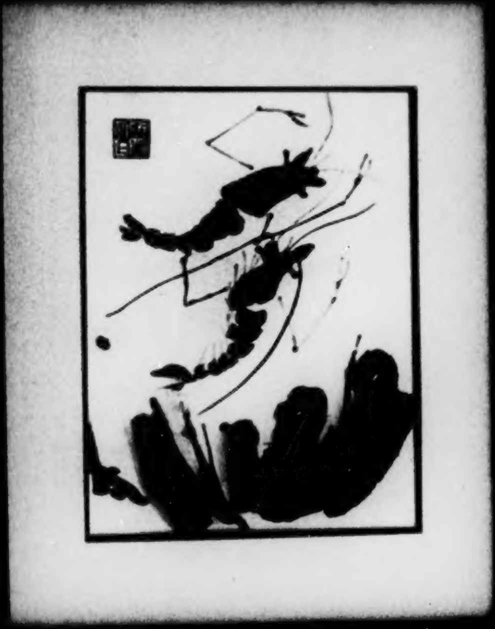
I also brought home a new perspective on my art. China is a truly different world from California. At home, it seemed that I could never quite escape from the noise, traffic, and cement. But, despite increasing industrialization, China retains its rural and traditional roots, and a peaceful feeling of closeness with nature permeates life there. Spending time with my Chinese relatives amid the breathtaking scenery gave me a feeling of serenity that still fills me when I paint.

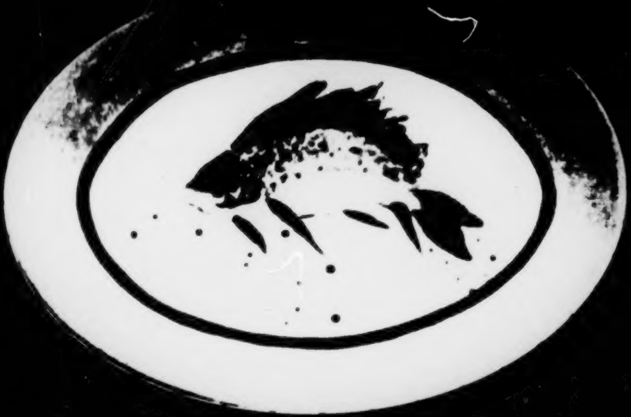
After the *First Lotus*

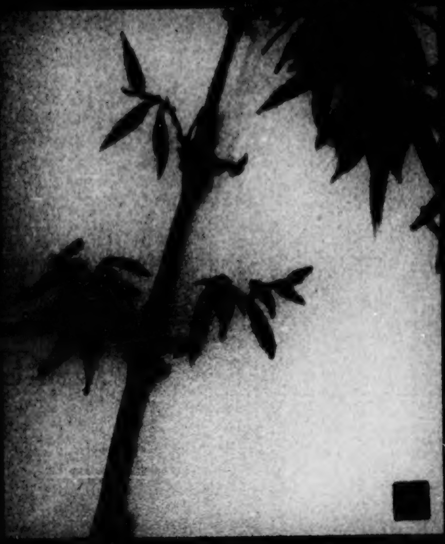
When I returned, I was determined to remember and preserve my experiences in China. I made a huge scrapbook for my whole family. I also continued training in brush painting with a new teacher, became the youngest member of my local art association, and soon took first prize in the People's Choice Competition with my painting *First Lotus of Spring*.

Like most students, I had begun my training with the "Four Gentlemen," which symbolize standards of virtue: the bamboo (flexibility and perseverance), the Chinese orchid (modesty and purity), the chrysanthemum (fortitude and patience), and the plum blossom (rejuvenation after adversity). Now I branched out into landscapes and animals such as fish, shrimp, tigers, and horses. I discovered that I have talent. I found a way to express my Chinese self as never before.

Continued on page 31







A senior at Santa Monica High School and an active volunteer in her community, ***Jessica Kinloch*** *spent part of her summer doing research at UCLA on the biomechanics of jumping fish and mutant inversion sequences in salmonella DNA. Also an award-winning pianist, Jessica will play the Brahms C Major Piano Trio with two Los Angeles Philharmonic musicians this fall.*

PLANNING AHEAD FOR COLLEGE

by Linda Brody, Ed.D.

Academic preparation is the first and most fundamental aspect of getting ready for college. Begin planning your academic schedule in middle school and continue throughout high school so that you will acquire the background and credentials required by the college of your choice.

Also set aside time to contemplate your own needs and to investigate college offerings. If you wait too long, you may find yourself as a high school senior confused about what you want in a college, with no idea of when to apply, and without the course preparation you'll need to succeed.

We offer this calendar as a guide to help you plan ahead.

A Calendar for College Planning and Preparation – Part I: Grades 7–9

Part II, for grades 10–12, will appear in the next issue of Imagine.

Grades 7 & 8

- If you're eligible, participate in a regional talent search. You will gain insight into your abilities and educational needs, along with access to a network of educational opportunities and information.
- Take challenging courses. Investigate getting high school credit for advanced courses taken in middle school.
- Study a second language.
- Develop your writing skills through your course work and by writing on your own.
- Develop your computer skills. Become proficient at word processing; learn a programming language.
- Consider supplemental educational opportunities such as academic summer programs, distance learning options, and part-time high school or college courses.
- If you are having any academic difficulties, seek tutorial assistance. If difficulties persist, consider being evaluated for possible learning disabilities. Waiting too long to get help could leave you without the knowledge base to succeed in high school.
- Join clubs and activities that allow you to experiment with new interests.
- Read books, periodicals, and newspapers to improve your verbal abilities and expand your knowledge.
- Investigate career fields through reading,

Grade 9

- Review your four-year plan with your high school guidance counselor. Include rigorous courses in math, science, English, social studies, and at least one second language, as well as electives in other areas of interest. Plan to take Advanced Placement (AP) courses before you graduate or to enroll in an International Baccalaureate program if it's available.
- Consider whether summer programs, part-time college courses, or other supplementary options should be part of your four-year plan to provide you with sufficient preparation for college.
- Evaluate your current courses and make changes if necessary. Course work should be challenging and rigorous, but not so difficult that your grades are poor or that you lack confidence in your abilities.
- Seek help in developing any skills you need to succeed in your courses—especially writing, computer, and study skills.
- Participate in extracurricular activities. Begin to identify those that really interest you and in which you might aspire to hold a leadership position.
- Investigate the resources of your school guidance office or career center for college and career information.
- Take a career assessment inventory that gives you insight into your personality profile and helps you identify career options that will satisfy you.
- Take any SAT II Achievement tests and AP exams relevant to your 9th grade courses. If you will continue course work in certain subjects, such as English, postpone SAT II tests to maximize your score later.
- Read books, periodicals, and newspapers to broaden your base of knowledge and understanding.
- Begin to visit colleges in your area and tour others while on vacations. Even if these particular schools

> *"You can't afford to wait until your third year of secondary school to get serious about college. Admissions officers look at your transcripts from the ninth and tenth grades, too. And not just at your grades, but at the courses you've chosen to take. So you need to choose your curriculum carefully. Middle school is not too early to begin."*
>
> *Paul White*
> *Director of Undergraduate Admissions*
> *The Johns Hopkins University*

volunteering, and talking to adults about their work.

- Evaluate high school options in your community. For example, is a magnet school or International Baccalaureate program available?
- In cooperation with your middle school guidance counselor, develop a tentative four-year plan of high school courses.
- Use your summer to expand your learning: take a course, travel, and/or pursue volunteer work in an area of interest.

don't interest you, early visits will help clarify what you want in a college or university.

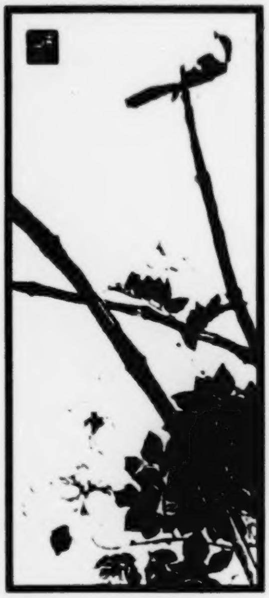
- At the end of the school year, reevaluate your four-year plan. Consider whether you need to arrange any courses for fall outside of school, e.g., at a local college or through a distance learning program.
- Use the summer to expand your learning: take a course, travel, and/or pursue volunteer work in an area of interest. ▼

▶ *Brush Painting–from page 29*

As my work progressed and my paintings fanned out around the house, I decided to aim for a solo art exhibition. Over a period of many months, I painted and painted, working to get each piece mounted and framed. Ultimately, my solo exhibition included nearly 30 paintings, and I sold almost all of them. In fact, I am still doing paintings on commission! I am planning another show for next year.

When I went to China, my name was Jessica Kinloch, but I returned with a Chinese name consisting of three characters: "Three Suns" (because I have two other siblings), "Outstanding," and "Philosophic Mind." My name is now engraved on a chop and appears on all of my paintings. A new world has opened for me. ▼

More Than Paint on Paper



Chinese brush paintings usually depict animals or landscapes, highlighting the animal's or plant's main characteristic. Most Chinese paintings have as much space as paint, creating harmony and contrast, especially in paintings using only black ink. Underlying the simplicity and harmony of each composition is the Chinese philosophy that all natural forms embody a unifying pattern of life. This unity is based on opposing and equalizing forces of nature; despite fluctuation and change, there is always balance and continuity, symbolized by the feminine, *yin*, and the masculine, *yang*. In an iris, for example, the delicate petals of feminine nature surround the male pollen tubes and are supported by the male calyx and stalk.

Early Chinese brush painters believed that to transmit the quality of life, the brush must be infused with spirit. This is especially true in the powerful *po mo* style, which is the one I use. In *po mo*, which translates into "throwing the paint," the artist must "see" the essence of the subject and capture it on paper with bold, quick, and fluid strokes.

Solution to Word Wise

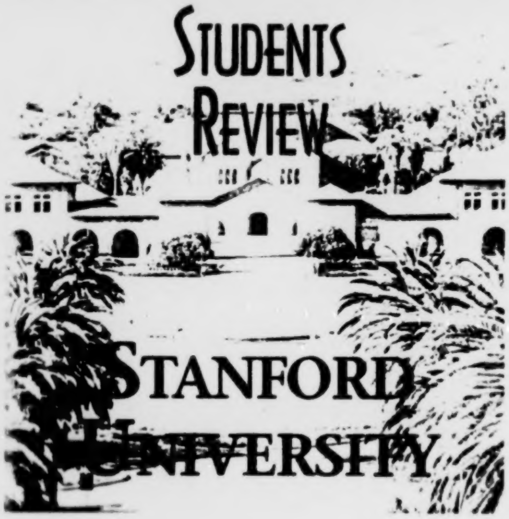
K	I	S	S	I	N	G	E	R	■	■	B	A	R	D
I	R	K	■	■	■	A	T	O	M	S	■	M	E	A
N	S	■	F	A	A	■	C	U	R	I	E	■	D	L
G	■	C	R	O	S	S	■	T	I	L	L	S	■	A
■	P	A	U	L	I	N	G	■	■	I	I	I	■	I
■	A	L	I	■	N	U	N	■	S	C	O	T	■	L
C	U	L	T	■	■	F	U	S	I	O	N	■	M	A
H	L	A	■	K	A	F	■	I	N	N	■	S	A	M
U	I	■	W	I	L	S	O	N	■	■	C	A	S	A
R	■	L	A	P	P	■	A	G	E	■	A	D	O	■
C	■	G	A	L	■	■	F	E	Y	N	M	A	N	■
H	■	E	L	I	O	T	■	R	E	B	U	T	■	B
I	F	■	S	N	A	R	E	■	S	A	S	■	M	U
L	O	U	■	G	R	A	V	E	■	■	■	T	I	C
L	E	V	I	■	■	P	A	S	T	E	R	N	A	K

More about ... Pauling

Linus Pauling is the only person ever to win Nobel Prizes for achievements in both science and peace. He is also the only winner of two unshared Nobel Prizes. He won the 1954 Nobel Prize in Chemistry for his research on the nature of the chemical bond. His Nobel Peace Prize recognized his campaign against nuclear weapons. In 1958, he presented the United Nations with a nuclear disarmament petition signed by 11,000 scientists and Nobel laureates. On October 10, 1963—the date the US-Soviet test ban treaty went into effect—he was awarded the 1962 Nobel Peace Prize.

STUDENTS REVIEW

STANFORD UNIVERSITY



The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.

Our reviewers include 22 students who major(ed) in biology (3), classics (1), computer science (5), earth systems (1), electrical engineering (4), environmental engineering (1), Japanese (1), math (6), physics (3), political science (1), psychology (1), and symbolic systems (1). (The number of majors exceeds 22 because several students have double majors.) Students' comments appear within quotation marks.

Quality of Academic Instruction for Undergraduates

Reviewers praised the educational and research opportunities, emphasizing that students must show initiative to get the most out of what Stanford has to offer.

"Overall, the academics are superb. The technical (math, science, and engineering) environment is *fantastic*, with especially strong undergraduate programs in biology, chemistry, chemical engineering, computer science & engineering, and electrical engineering. The resources and faculty are exceptional—plenty of undergraduate research opportunities available with world-class faculty—but individual initiative is required in order to take advantage of them."

"In every department, the academics are, or rival, the best in the nation. The psychology department faculty list reads like a *Who's Who* from a Psych 1 textbook. Economics, computer science, philosophy, and many other departments boast great faculty who really want to teach."

"Stanford is abuzz with intellectual energy in fields from computer science to psychology to English. Most of my classes have been taught quite well. Intro courses are large, but when I've taken the initiative to talk to professors, they've always been open and responsive. Recently, in an effort to get students interacting with faculty early on, Stanford has created dozens of small seminars for freshmen and sophomores. Furthermore, for many Stanford students, undergraduate education means more than just taking undergraduate classes. Graduate classes are open to well-prepared and enthusiastic undergraduates, and there are many opportunities to get involved in research."

"Academic resources are excellent. Proximity and close ties to Silicon Valley give us incredible computer facilities and many valuable internship opportunities. The libraries are big enough to get lost in, and ample tutoring resources are available for students who need help."

"The computer science department is great. Classes are well-staffed, especially the introductory ones, and the department takes good care of its majors, providing lots of benefits and opportunities. The math department, on the other hand, has long been regarded as one of the school's weaker departments where undergraduate teaching is concerned. The department now has a new chairman, who is trying to remedy that."

"There isn't as much competition or emphasis on grades as I've heard about at Ivy League schools. Students support each other's academic efforts rather than struggling to top one another. A friend who visited during finals observed, 'Stanford is more relaxed and stress-free during finals than Harvard was on any weekend.'"

Social Life

The focus of social activity at Stanford is the dorms, where numerous cultural and academic events occur as part of the university's "Residential Education" program. The Greek system is fairly small. Palo Alto is not a college town; students in search of the cultural offerings of a city must travel to San Francisco, approximately 30 miles north and accessible by train (with a station just off campus).

"Unsurpassed. The exposure to intelligent students from all over was incredible. And these students can have *fun* while pursuing excellence. The weather, living conditions, friendly atmosphere, and opportunities simply cannot be rivaled. Intramural sports are extremely popular, and the Bay Area is a cultural motherlode."

"We are a very athletic campus; people are always running, going to dance class, or playing intramural something with friends. The program as a whole has won the Sears Trophy (for the best Div I sports program) for the past four years."

"Housing at Stanford is terrific! Not because it's beautiful (although most of it is) and certainly not because the food is good, but because of Residential Education. Your dorm becomes the center of your life, and all 90 people in it are your friends. This creates tight friendships freshman year, but it can also limit your scope of interaction and privacy. Even so, most people choose to live in campus housing all four years. It's wonderful."

"Stanford's social scene has been ideal for me. The stereotype of Stanford students being more laid back than their East Coast counterparts is fairly accurate. Rather than shutting themselves in their rooms to study all week and then letting loose on the weekends, people at Stanford tend to strike a continuous balance. This balanced lifestyle has some very positive effects: for example, while binge drinking does occur, it's not as prevalent here as at many other schools. Also, most Stanford people are nice. Levels of arrogance are surprisingly low, given how much the people here have to be proud of."

"My favorite thing about the Stanford social life is that it's so accepting. People who live in co-ops like the 'Enchanted Broccoli Forest' go to parties at frat houses and vice versa."

"Stanford is a big, self-sufficient, very safe campus. You can bike around at virtually any time of night without any worries. It has an insulated feel to it in part because of its sheer size; the central campus is 2,300 acres. It's so large that most students spend all their time on campus."

"Palo Alto has become quite a social town in the past few years. But, while there is lots to do there at night, it is not geared toward students. Even seniors will feel awkward at the popular bars, where yuppies and cell phones abound!"

What Do You Like Best about Stanford?

"The intellectual and social community. I could go anywhere and read textbooks or listen to lectures, but what's unique about Stanford is the opportunity to get to know so many exciting people. And this community is not limited to undergraduates; I've benefited from interactions with grad students, faculty, staff, and the constant stream of visitors from around the world who come to share in Stanford's excitement."

"College is not about four years of problem sets, GPAs, and exams. It's about *learning* and *growing*. I am convinced that nowhere else would I have found the combination of academic excellence and opportunities for personal and social growth that I found at Stanford."

"Academically, the thing I liked best about Stanford was its *balance*. It has world-class departments in math, science, and engineering, as well as in fields such as economics, psychology, political science, and history. And the good weather year-round makes it easy to unwind with a game of basketball or Ultimate Frisbee after a day in class or in the lab."

What Do You Like Least about Stanford?

"Having to leave."

"Because Stanford is such a great place, some people fall into the trap of thinking that it's the *only* place—the center of the universe. Being out of school made me realize that life does continue after Stanford and that I can have a great time away from 'The Big Taco Bell.'"

"There are times when the administration seems to focus too much on athletics and fund-raising, and some students seem too materialistic and career-oriented. But these problems may be inevitable at any large university, and they don't keep me from enjoying all that Stanford has to offer."

"While the CS program is very strong, the culture is a little over the top (although this may be true of CS students everywhere). There's something wrong when people brag about how few hours they sleep in a week. I want to learn, but I also care about my health, and I want enough time to take advantage of the intellectual opportunities college provides outside of class."

Who Would Be Most Compatible with the Academic and Social Atmosphere at Stanford?

Reviewers repeatedly emphasized three qualities: intelligent, responsible, and somewhat mellow.

"No ultra-intense, bragging, competitive people belong here. It's hard to see yourself as being that way; but if you are the type who is motivated by the thought of being Number 1, don't come here. It's not that you won't find plenty of competition; it's just that very few people here like to talk about their accomplishments."

STANFORD UNIVERSITY

Stanford, CA 94305
650-723-2091

- 4-year private coed university
- Suburban campus in a large town 30 miles south of San Francisco
- Full-time undergraduate enrollment 1998-99: 3,310 men; 3,281 women
- Special features: Stanford Linear Accelerator Center, Wilcox Solar Observatory, Stanford Museum of Art, Cantor Arts Center, Rodin Sculpture Garden with more than 20 works by Rodin, 1,200-acre nature preserve, marine biology station.

"Someone who can do exceptional work while remaining somewhat relaxed, and who will take the initiative to seek out academic opportunities. People who stress a lot about studying and grades will probably feel that they don't fit in, while people who worry that they'd get lost among the multitude of opportunities at a major research university might do better at a smaller school."

If You Had It to Do Over, Would You Go to Stanford?

All but one reviewer said yes, most with great enthusiasm. Echoing earlier comments, they emphasized the excellence of the whole experience. As one student put it, "I've loved Stanford; it's a great place to **live**.*"*

"Yes. I don't think anyplace else provides academic excellence in as many areas, with as nice a standard of living."

"Absolutely! It would be hard to do better. Where else could you find #1 academic programs with #1 athletic programs? Stanford is Yale academics in a younger environment, with sun, fun, numerous winning teams, and the best people you could ever meet!"

"Yes. I loved being challenged and learning and studying and enriching myself, but I also loved spending time with friends, being involved in school activities, and playing touch football for study breaks. I think I loved it there so much because I have both studious and playful sides."

"At first, I wasn't sure. My freshman year was so overwhelming. But I've come to value my experience here. The high academic caliber has pushed me to do my best, and the motivation and achievements of the other students have been inspiring. I was looking to be challenged, and Stanford has certainly done that. I just didn't realize how much better I could be."

"I torture myself over that question. It's hard to say no, because I wouldn't be the person I am now without the past three years. But think that a college whose primary focus is undergraduate education would have been better for me."

As you try to find the college or university best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAAY. ▼

Creative Minds Imagine

Something I Lost

by Ben Evans

Once I lost an important thing
I lost the freedom
Of the open meadow
I lost the smell
Of the hot, dry grass
But I gained something too
I gained the crystal beauty of rain
Little drops on all the windows
Water, rushing across the porch
Washing the dirt away
Cleansing, powerful, necessary, watering
I wasn't sad though
I knew the freedom of the field
Would come
Again and again
Subsiding to the rain
And returning
Like the seasons of the year,
Constantly revolving
Coming and going
Always returning
Always rejoicing

Cool on the Outside Like Her

by Elizabeth Lerner

She says things so easily and all of the time
I want to be exactly
That way—this moment.
She has studied calm and mastered the plan.
I just want to sound so sure.
She is the rebel, I am the meek
With ideas that may be bold but
Dress that is surely not.
She is the wild child,
The one who would be
The trouble maker if only
She made trouble.
I get intimidated.
That is, when I don't get mad.
Sometimes I think she's the biggest imitation of all,
A joke more than anything.
Other times it's all me,
As the dull one, the one trying to fit in
When I should be cool
On the outside like her.

Sunday Morning

by Elizabeth Lerner

Alone in her room,
Blanket wrapped around her shoulders,
She listens to folk songs on the radio,
And, with her notebook open, daydreams.

Right now Bob Dylan's voice whines through the speakers.
The room is just cold enough
To make time slow down a little.
With the plastic shades drawn,
The lone 60-watt bulb casts a faint halo
On the room, illuminating
The cracks in the faded stucco.

Her pencil sounds rough when it hits the page,
But her letters curve elegantly,
Making her feel like an artist,
And eventually
Lulling her into a state
Of semi-conscious calm.
Life now is a little too cold to be perfect,
But even the air
Seems more pensive than usual.

***Ben Evans** is a freshman in the International Baccalaureate program at Richard Montgomery High School in Rockville, MD. He enjoys writing, math, history, 4-H, Boy Scouts, and living on his family's grain farm. He has participated in CTY summer programs since 1995.*

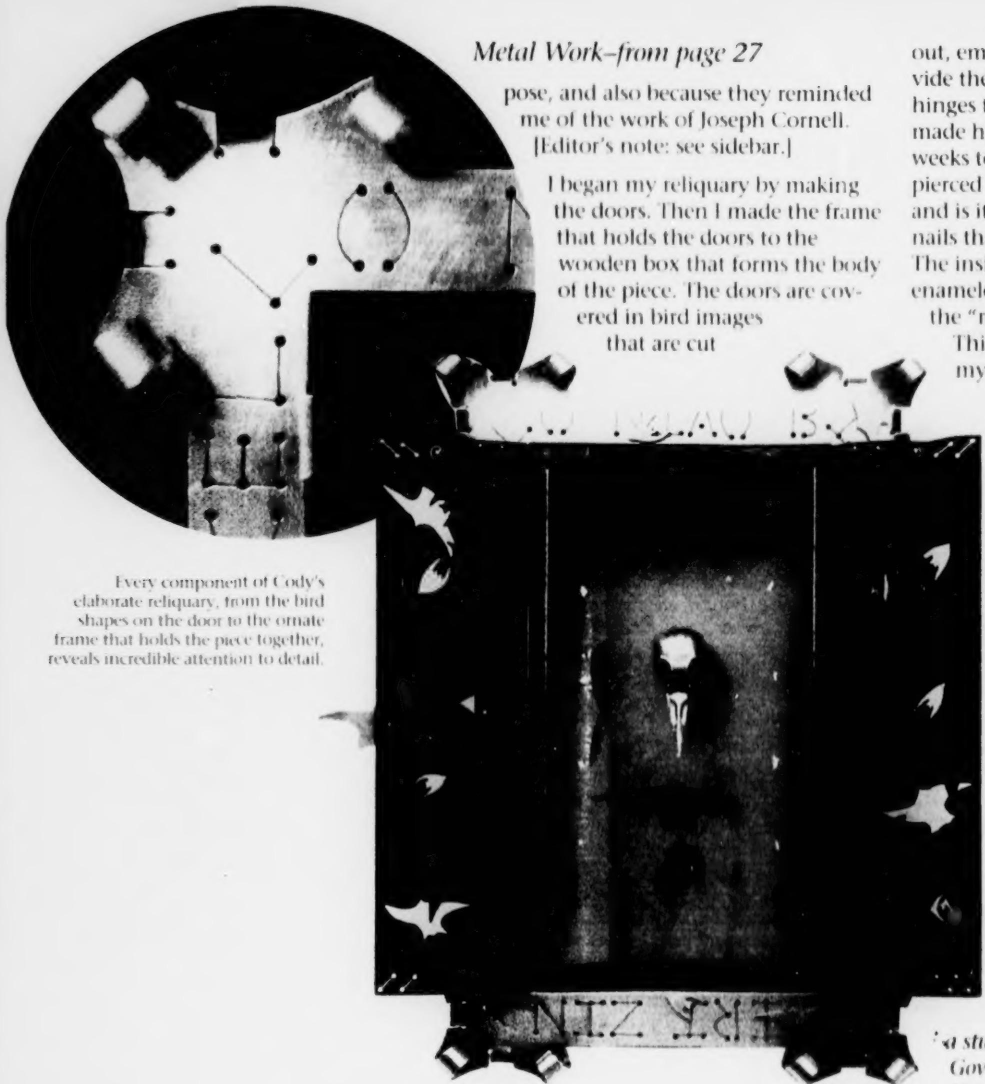
***Elizabeth Lerner** is a junior at Hartford High School in White River Junction, VT. She enjoys acting, folk music, and snowshoeing, and is active in the peer helpers program, a local program that trains teens to better help other teenagers in the community.*

Metal Work–from page 27

pose, and also because they reminded me of the work of Joseph Cornell. [Editor's note: see sidebar.]

I began my reliquary by making the doors. Then I made the frame that holds the doors to the wooden box that forms the body of the piece. The doors are covered in bird images that are cut out, embossed, and soldered on top to provide the illusion of depth. I also made hinges to connect the doors to the frame ("I made hinges"—three words to say, three weeks to do). The frame has the word "bird" pierced into it in eight different languages and is itself fastened to the box with ten nails that I made with bird-shaped heads. The inside of the box is filled with a curved enameled panel that acts as a backdrop for the "relic," which is a gilded bird skull. This bird theme, too, was inspired by my Italian experience. Throughout Italy, no matter where I was, the one thing I always saw was pigeons. Looking back, though they were loud, ugly, and annoying, I remember them fondly, and that is what a reliquary is all about: fond remembrances.

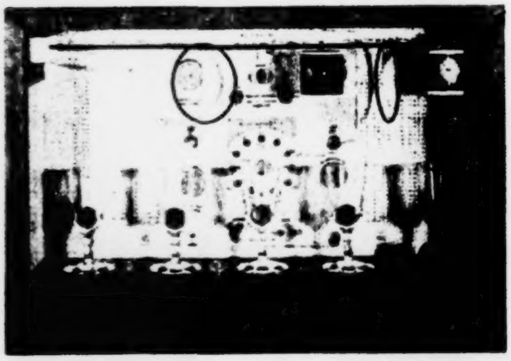
Creating this piece of art was a profound experience for me. The act of working so hard to create something so beautiful was very fulfilling. The project took on dimensions that I never imagined, and I grew along with the piece. ▼



Every component of Cody's elaborate reliquary, from the bird shapes on the door to the ornate frame that holds the piece together, reveals incredible attention to detail.

***Cody Chance**, 17, of Greenville, SC, enjoys eating sushi, backpacking, swing dancing, and cooking. This summer he worked as a studio assistant at the South Carolina Governor's School for the Arts and Humanities.*

Joseph Cornell and the (Extra)ordinary



Joseph Cornell, *Untitled (Solar Set)*, c. 1956-58. (c) The Joseph and Robert Cornell Memorial Foundation

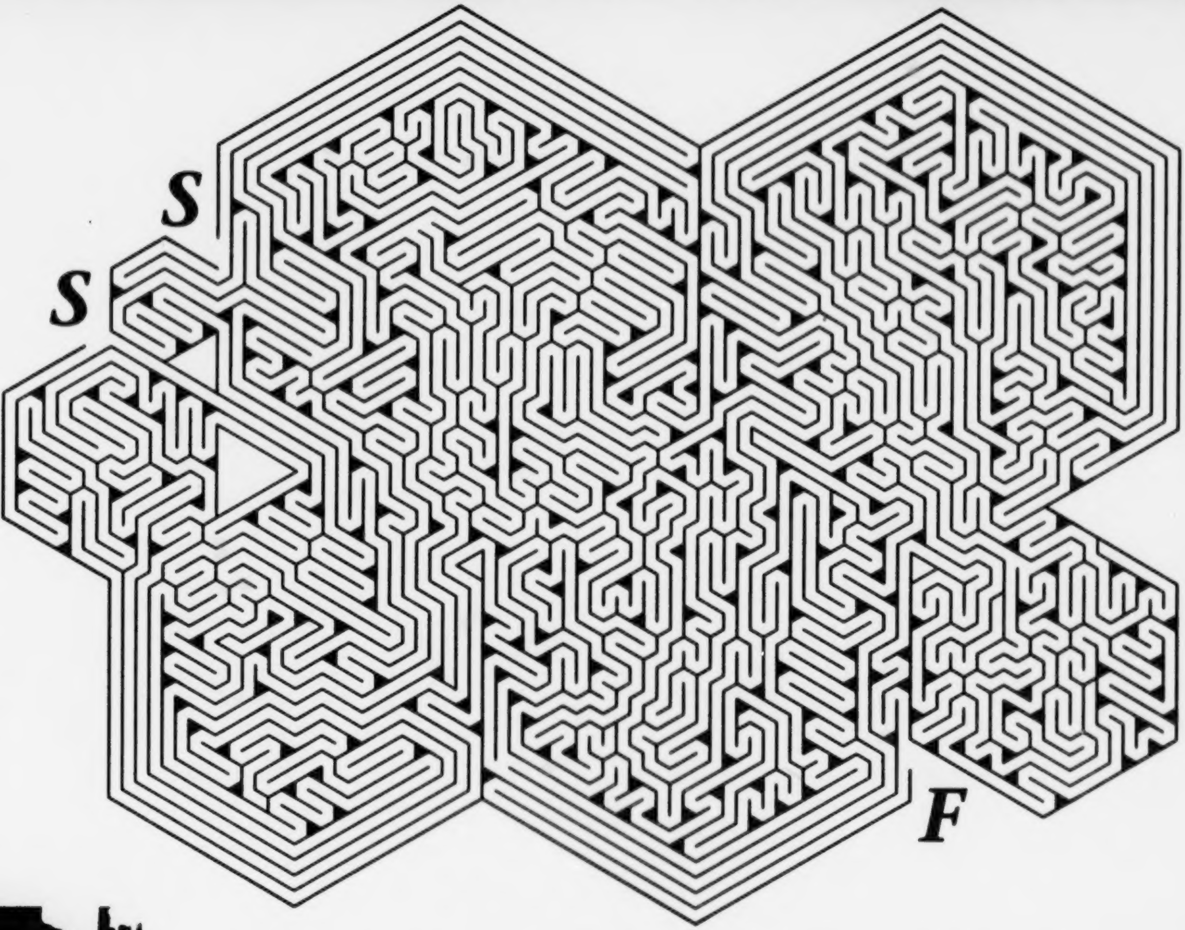
Have you ever had the chance to explore your grandparents' attic or browse a flea market or junk shop? If so, you've seen the raw material of Joseph Cornell's art.

Born in 1903, Cornell had no formal artistic training and didn't even graduate from high school. During the 1920s and '30s, he sold woolen samples door-to-door, and between appointments he shopped for old books, records, photographs, and assorted oddities at junk shops and bookstores. He later referred to his collection as a "picture gallery, museum, and clearing house for dreams and visions."

Although he also painted and created collages and Surrealist films, Cornell is best known for his box constructions. In these boxes, he juxtaposed objects that we don't expect to see together—marbles in cocktail glasses that are spaced evenly below suspended brass rings, all against a background of maps and charts—to create magical, fantastic worlds.

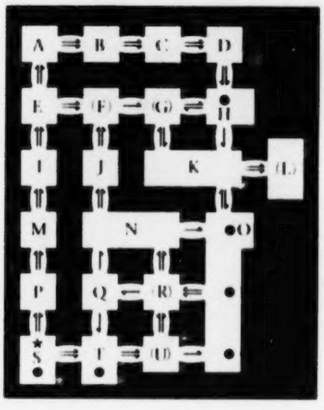
Many of Cornell's boxes incorporate memorabilia from such foreign lands as France and Africa—places he never visited. In fact, aside from attending school in Massachusetts, Cornell never left New York. It turns out that many of the place names he used were his own invention, adding another layer of fantasy to the journeys we take in viewing his boxes. —MH

OSS AME



A graduate student in educational psychology at the University of Wisconsin, ***Tim Boester*** *now has additional puzzles on his home page: www.math.wisc.edu/~boester*

Solution to Knossos Game in our May/June issue

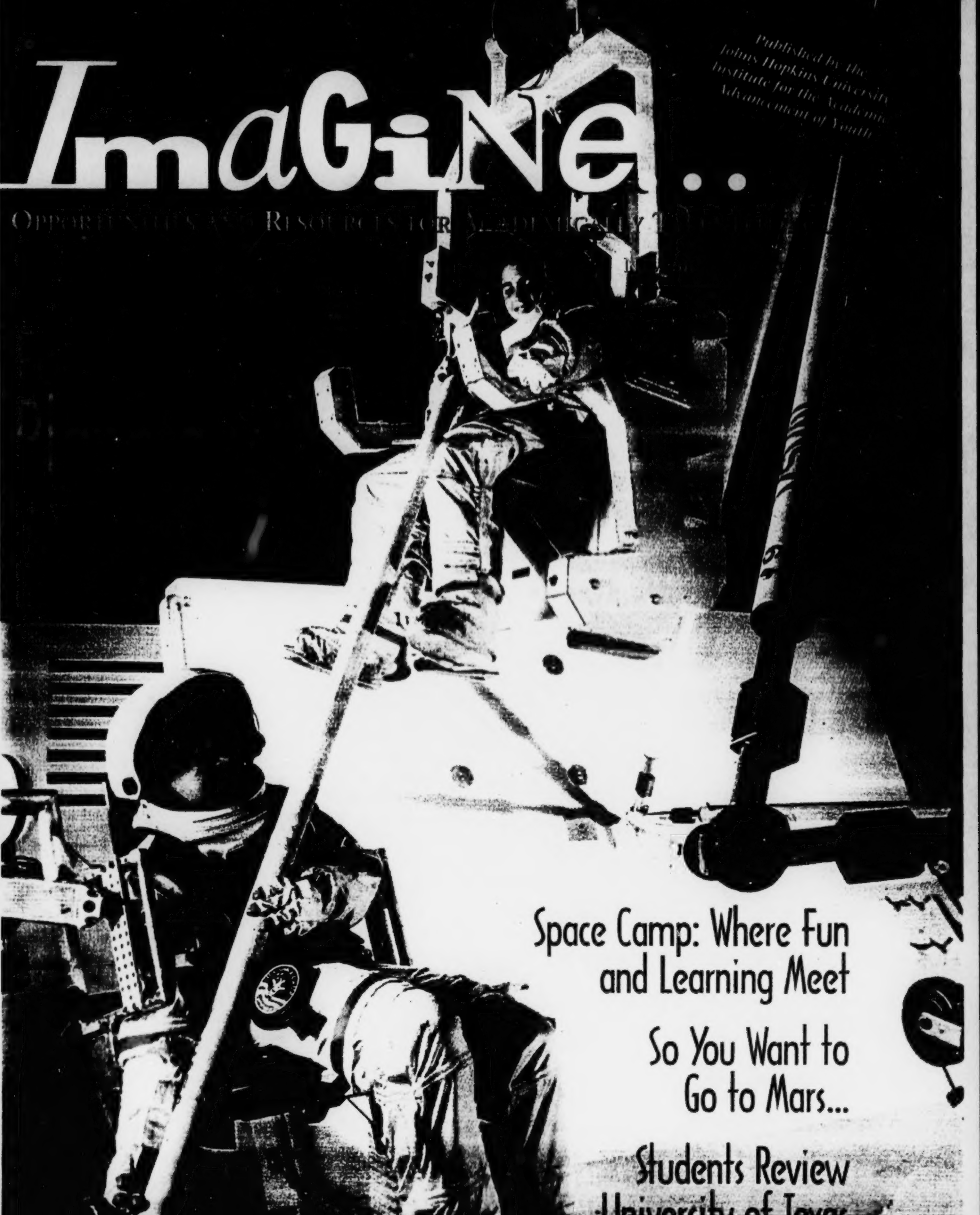


●	S	S	P	M	I	E	A	B	C	D	H	K	O	R	Q	T	U	O	R	N	J	F	G	H	K	G	H	K	L
●	S	S	P	M	I	E	A	B	C	D	H												H	O	G	K			
●	H																									H	G		
●	O											O	K															K	L
●	O												O	R															
●	O					'												O	R	N	J	F							
●	T															T	U												

Imagine...

Opportunities and Resources for Academically Talented

Published by the
Johns Hopkins University
Institute for the Academic
Advancement of Youth



Space Camp: Where Fun and Learning Meet

So You Want to Go to Mars...

Students Review University of Texas

C▸O▸N▸T▸E▸N

Features

4 So You Want to Go to Mars ...

NASA's John Connolly discusses the possibility of a human mission to the Red Planet.

7 Moon, Earth, and Sea: A Cross Section of Planetary Sciences

A planetary geologist, a sea ice modeler, and two seismologists reveal that the work of planetary scientists is as fascinating as it is diverse.

10 Detecting Tornado Starters

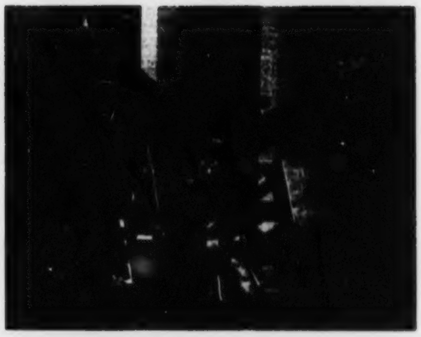
At age 17, Jay Michaels has become a respected authority on misocyclones, and his research could end up saving lives.

12 In Search of... M-Class Planets

With a next-generation telescope, NASA scientists will go beyond our solar system to seek out new life and new habitable planets.

14 Studying Earth and Mars at Earthwatch

Why spend part of your summer on a glacier? Or in a wind tunnel? Lisa Ehrlich and Jenny Fisher explain.

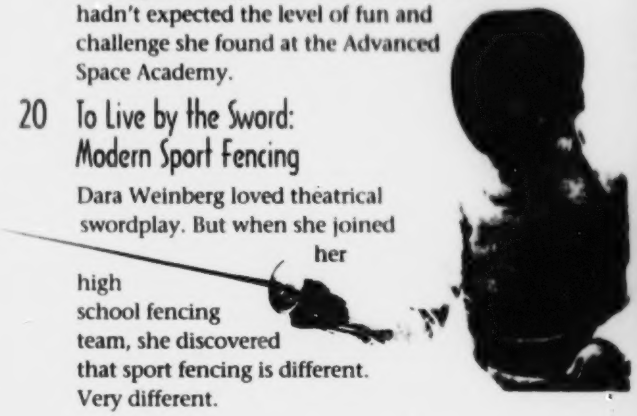


18 Space Camp: Where Fun and Learning Meet

Even Space Camp alum Katherine Yakubisin hadn't expected the level of fun and challenge she found at the Advanced Space Academy.

20 To Live by the Sword: Modern Sport Fencing

Dara Weinberg loved theatrical swordplay. But when she joined her high school fencing team, she discovered that sport fencing is different. Very different.



Departments

22 Off the Shelf

Review of Barbara Tuchman's *A Distant Mirror: The Calamitous 14th Century*

23 Word Wise

24 Exploring Career Options

Interview with Foreign Service Officer Bill Martin

27 Mark Your Calendar

28 Planning Ahead for College

College planning calendar for students in grades 10, 11, and 12.

30 Students Review University of Texas

32 Creative Minds Imagine

Poems by Michael Bleicher and Claire Whitenack

33 The Coach's Corner

36 Knossos Games

ImaGiNe...

*Opportunities and Resources for Academically Talented Youth**

ISSN 1071-605X
Volume 7 • Number 2
November/December 1999

Copyright © 1999 by The Johns Hopkins University.

*A trademark of The Johns Hopkins University.

All rights reserved. No portion of this journal may be reproduced by any process or technique without the formal consent of the Johns Hopkins University Institute for the Academic Advancement of Youth.

Published five times a year—September/October, November/December, January/February, March/April, and May/June.

Periodicals Postage paid at Baltimore, MD, and additional mailing offices.

POSTMASTER: Send address changes to Imagine, P.O. Box 3073, Langhorne, PA 19047.

Imagine is published by the Study of Exceptional Talent (SET) at the Johns Hopkins Institute for the Academic Advancement of Youth. This publication is an outgrowth of newsletters and programs that, for twenty-five years, have served highly talented students identified by the Study of Mathematically Precocious Youth and by SET.

Editor • Melissa E. Hartman
Assistant Editor • Diane Clavier
SET Director • Linda E. Brody, Ed.D.
Research Associate • Carol C. Blackburn, Ph.D.
Editorial Assistant • Mary Parker
Editorial Assistant • Rachelle Lipschultz
Designer • Delta Graphics & Communications

Annual subscription: $25.00
Institutions: $30.00

Address subscription inquiries to:
Imagine
P.O. Box 3073
Langhorne, PA 19047
(215) 826-0707 • fax: (215) 788-6887

Address editorial correspondence to:
Melissa E. Hartman
SET/IAAY
The Johns Hopkins University
Baltimore, Maryland 21218
(410) 516-0309 • fax: (410) 516-0108
email: mhartman@jhu.edu

Web site: www.jhu.edu/gifted/imagine

On the cover: In a simulated space shuttle mission, two Space Camp participants practice constructing a space station. Photo courtesy of Space Camp.

All About Opportunities

Ever wonder why so much of every issue of *Imagine* is written by students?

When we put together an issue, we want to do more than tell you what opportunities exist. By giving you first-person accounts of diverse educational experiences, we hope to inspire you to find similar opportunities in your own community—or even to create such opportunities where none exists.

Consider the case of one of this issue's writers, 17-year-old Jay Michaels. The path to his first-place win at the Intel International Science and Engineering Fair began with phone calls to his local National Weather Service office. First an unofficial "storm spotter," then an intern, Jay eventually combined his interest in severe weather with local—and later, national—resources to develop an award-winning and ongoing research project. In his article, and in every other article in *Imagine*, lies a message for talented students: Talent is more than what you know. Having talent also means strengthening your abilities by continuing to challenge them. And that means finding, or making, opportunities.

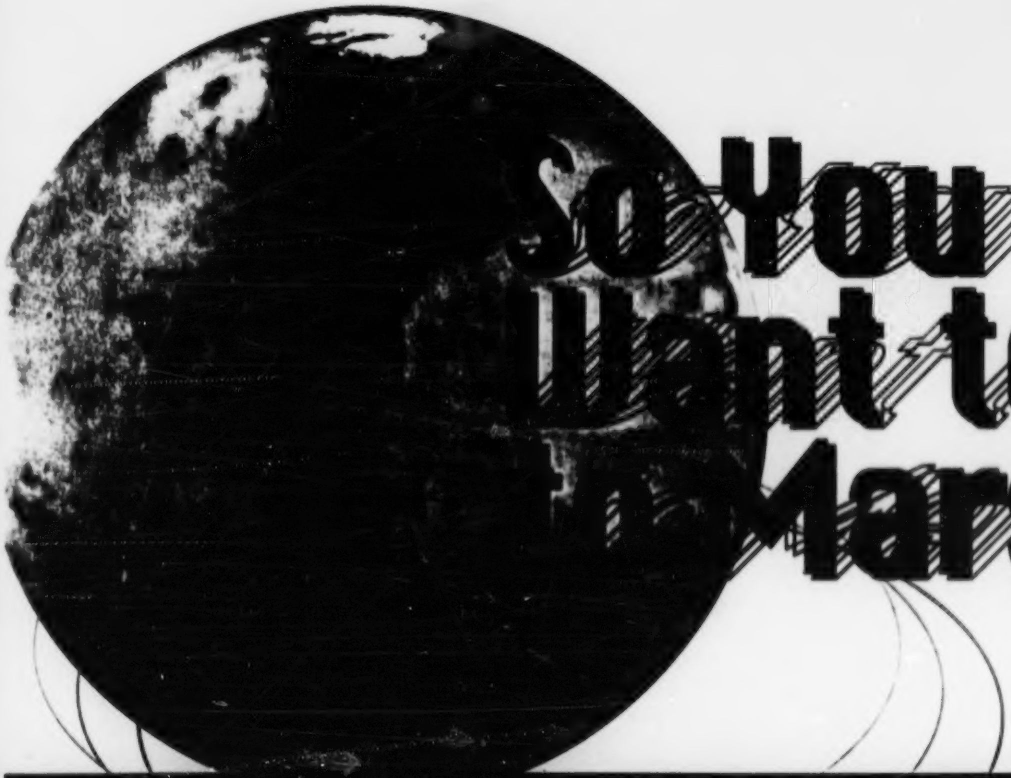
> “The articles about students protecting the planet inspired me to take action in my community. I am eager to spread the news and visit Web sites, hoping to get my school's Science Club interested.”
>
> —Jennifer, grade 10

Issue after issue—whether they're writing about math or history or science—our student writers exemplify that definition of "talented." And that's what we hope you'll be inspired to do.

> “I owe a lot of my success in math competitions to an issue you did. My school officials didn't know about the AHSME until my mom saw the article, made some calls, and got my school to participate. Since then I have qualified for the USAMO and participated in ARML.”
>
> —Cody, grade 12

Want to write for Imagine?

We're still making plans for upcoming issues focusing on Computer Technology and the Social Sciences. If you want to share an experience relevant to one of those topics, let us know. Or even if you've done something unrelated to those topics that you've found valuable and satisfying, drop us a line. Of course, we always accept creative writing. Write to us at Imagine, SET/IAAY, 3400 N. Charles Street, Baltimore, MD 21218; or e-mail the editor at mhartman@jhu.edu.



So You Want to Go to Mars...

Interview with John Connolly

by Melissa Hartman

When will the first [illegible] mission to Mars take p[illegible]

[illegible] we need to make sure that we have all the technology to make the mission possible, and we'll also need public and political support for the mission. The earliest that these could converge is probably somewhere around the year 2015 but more realistically it'll be near the end of the second decade of the 21st century.

[illegible] NASA [illegible] planning for a [illegible]

[illegible] we were planning the Apollo program [illegible] of the ways to get the same [illegible] initially it was just going to [illegible] actually land, but we would [illegible] to do some [illegible] to Mars.

[illegible]

fired the engines to go, it will be two and a half years before you come back.

How long will the crew stay on Mars?

Once we get there, we have two choices: a long-stay mission or a short-stay mission. On the short-stay mission, the crew would stay on the surface or in orbit maybe 30 days at the most, and then spend about a year coming home. That trip home will be kind of tricky because the Earth is rotating around the sun much faster than Mars is, and won't be in the right place for a quick return. The crew would have to cut inside the orbit of Venus and take a very long trip back to Earth. And it takes lot of energy to do that.

In the long-stay mission, they'd stay on the surface for about 500 days, allowing the planets time to come back into alignment, and then take a short six-month trip back to Earth. We prefer the long-stay mission because it allows more time on Mars and allows us to focus things on the surface instead of on transportation. And of course the crew will spend less time in zero gravity. Being in free space is a nasty thing. It affects your bones, your muscles, your heart, the volume of blood in your body. So the less time spent floating around in zero gravity, the better.

What other risks are there to the crew?

The other big risk is radiation. In interplanetary space you're exposed to interplanetary radiation, like galactic cosmic rays. We don't get galactic cosmic rays here on Earth, but in space they create a constant background radiation. It won't kill you because it's a low, constant dose of radiation, but obviously you want to spend as little time in that as possible. But what's really bad are solar proton events (SPEs). This is when the sun "hiccups" and spits out a stream of protons. It's like a rain storm in that it builds up rather quickly, but if you have some way to sense that it's coming, you can shield yourself from it. The spacecraft will have a radiation shelter the crew can retreat to during SPEs.

What kinds of expertise will the crew need?

When we go to Mars, we're going to need the expertise of a lot of people who haven't been part of the space community in the past. We're talking about a mission that will require the crew to assemble things when they arrive. They're going to be producing rocket fuel out of resources they find on Mars. So already we're talking about people like chemical engineers and construction engineers. I think the crews will be different from the kind of crews that we pick today.

I know if I were going to Mars, I would want to take a bunch of people who are really good at plumbing and working on their own cars because things are going to break, pipes are going to leak. I would want people who know how to fix things, who are not afraid to tear things apart and put them back together.

Astronauts in our office here at JSC did an informal poll, asking what kind of people would make a good crew to go to Mars. The top responses, in order, were mechanic, expeditionary leader, electronic technician, saint, engineer, pilot, medical doctor, and computer whiz.

How many people will be on the crew?

Obviously we need a pilot and probably a backup pilot. We need a medical doctor and probably a backup to that. We need someone with psychological training and a fix-it person who knows everything about the spacecraft. We need geologists and biologists. We'll probably need paleontologists and anthropologists because they're trained to look for signs of ancient life.

When we added it all up, we figured we'll need 12 or 15 people, but we know that 5 or 6 is a practical limit. So the people we're going to send will be crossed-trained in a lot of those different specialties. We might have a person who is a pilot-geologist, which is exactly what we did in Apollo. Maybe we'll have a medical doctor-biologist, for example, and maybe one of the flight engineers will also be the pilot or co-pilot.

Aside from specific skills, is there anything else that will make a good Mars astronaut?

I think the psychological make-up for a crew going to Mars is going to have to be a little different from what we have today. Right now, although everybody's very team oriented, astronauts are picked based on individual educational and professional accomplishments. I think there will be less emphasis on this for a crew going to Mars, and more emphasis on how people function, both individually and as a team, in isolation and under

Left: With all engines running, the crew leaves Earth orbit and begins their 6 month voyage to the red planet. ***Center:*** The completed outpost on Mars includes the crew's two-story lander habitat and inflatable laboratory. The crew's ascent vehicle and propellant production facility can be seen one kilometer away from the completed outpost. ***Right:*** After landing on the Martian surface, the crew uses an unpressurized rover to unload cargo and supplies needed for their stay on the red planet. (NASA images by Bob Sauls/JF&A)

stress. In choosing the crew, we'll really be constructing a family. They're going to have to count on each other for their lives, basically. And that means they'll need the ability to solve problems and think on their feet.

How long before the launch will you select the crew to go to Mars?

I would guess we'd select a Mars crew several years before their flight. They would start living together and working together, seeing each other every day.

They'll continue their training on the way to Mars. A lot of the training can be done by computer or in an interactive training environment. For example, virtual reality is one of the things we are using in training for EVA (Extra Vehicular Activity), or space walks.

So they won't be very dependent on communications with Earth?

Once the crew is a couple of days away from Earth, there will be a delay of a few seconds between when we send a message and when they receive it. As they get closer to Mars, that delay will be more like 10 or 12 minutes. As Earth and Mars rotate around the sun at different speeds, that amount of time will vary between 8 and 40 minutes. That's a long time. We won't be able to have real-time communication with the crew—it will be more like leaving phone messages for each other.

That's why Mars crews will be more autonomous than current shuttle crews. Shuttle missions right now are scripted minute by minute. But on a Mars mission, we can't keep reminding people of what they're supposed to be doing, and we can't help them if they're fumbling a little bit. Instead, we might fax them a list of things we'd like them to accomplish that day—like deploy this telescope, take some readings, change the filters in this unit—and let them figure out how they are going to use their time that day to do it.

How soon after this first crew returns from their mission will the next crew take off?

Actually, while the first crew is returning to Earth, the second crew can be on their way to Mars. That way, the surface base will be left unattended only for a few months.

This also creates a kind of safety net for the first crew. While they're still on Mars, the cargo mission for the second crew will arrive. This will also serve as a backup of supplies for the first crew in case something happens to their cargo. By stacking the missions one on top of another, we can get a crew out of any bad situation.

How many missions are planned?

Right now, none are planned. But if a program to explore Mars is ever approved, then a minimum of three missions should be flown. That's the equivalent of 1,500 days on the surface of Mars, and with six people, that's 9,000 person days on Mars. That's a lot of experience and a lot of science that can get accomplished.

Of course, we don't want to see a Mars program go the way of the Apollo lunar program, either. The Apollo lunar missions were cancelled after Apollo 17 because the political "push" was no longer there. That's a chance we take with any big exploration program, and that's why we need to construct it carefully: so that it keeps producing fantastic science and commercial opportunities each time we fly a mission. After all, we want to see lots of people go to Mars—NASA is just there to lead the way the first couple of times.

What will the crew do when they're not working?

Videos were a favorite form of entertainment aboard Mir. Listening to music is another favorite; everybody takes up a Walkman. Video games will be an option because you can play anything that you can plug into a computer. But right now, the favorite form of entertainment for crews in Earth orbit is looking out the window. That's what the crews say they can't get enough of.

Is there anything else that you want to say to our readers about the mission to Mars?

Well, I've been working on this for 10 years now, and we really aren't that much closer to flying a human mission to Mars than we were 10 years ago. People ask, "Why do you even work on this?" It's quite simple. This is going to happen; there's no doubt about it. The only question is when. And when it happens, I want to be part of it because it is going to be the greatest thing humanity has ever accomplished. It is going to be the greatest adventure of all time.

Selected Resources

Mars Millenium Project
www.mars2030.net/

NASA's "Reference Mission"
www-sn.jsc.nasa.gov/marsref/contents.html

And the addendum to the Reference Mission:
www-sn.jsc.nasa.gov/explore/addendum/index.htm

To read more about John Connolly, including how he got interested in the Mars mission, see *mmp.planetary.org/astro/connj/connj70.htm*

And if you want another take on what's involved in terraforming Mars, check out *The Case for Mars: The Plan to Settle the Red Planet* by Robert Zubrin (Free Press, 1996).

[illegible]

The planetary [illegible] encompass fields as diverse as the planets themse[illegible] mineralogists, geo[illegible] and [illegible]ists, climatologists and volcanologists [illegible] stand the forces that have shaped and will continue to shape the bodies in our solar system. These briefs [illegible] types of research taking place close to [illegible]

MOON, EARTH, AND SEA

A Cross Section of Planetary Sciences

Other planets and moons have more in common with Earth than you might think. Studying their geology might help us make important discoveries about our own planet.

Planetary Geology

by Jeff Gillis

Planetary geology is part science and part adventure. The science part involves studying the composition, structure, and form of a planet and understanding the processes responsible for producing what we observe. The adventure comes from studying the geology of worlds outside our own, an exploration frontier where new discoveries are being made every day.

Our research provides information not only about the other planets in our solar system but also about Earth. This approach, called comparative planetology, allows us to discover what conditions may have been like on Earth in the past and how they may change in the future. For example, geologists examining the possible origin of life on Mars compare their findings to what we know about how life started here on Earth. Because data from both planets during this time period is scarce, a symbiotic investigation increases our understanding of how life may have started in both places. And to learn how the Earth's biosphere will change if greenhouse gasses (H_2O, CO_2, and CO) keep building up in our atmosphere, we can study our sister planet Venus, with its dense clouds of CO_2 trapping heat from the sun.

The data that planetary geologists examine come from satellites. For example, *Lunar Prospector*, *Mars Pathfinder*, and *Galileo* are providing data of unprecedented detail, revolutionizing our understanding of the planets. *Lunar Prospector* detected ice at the poles of the Moon, fueling plans for future missions and lunar bases. *Mars Pathfinder* transmitted high-resolution images of the Martian surface back to Earth, while its rover Sojourner roamed from rock to rock collecting chemical data. Last but not least, images from the *Galileo* spacecraft have increased our understanding of the outer solar system by transforming the moons of Jupiter from miniature points of light into discernible objects that possess structure, morphology, and a geologic history.

My particular field of research is lunar volcanism. Many people think of the Moon as a big cold rock floating in the sky, so it may come as a surprise to some to learn that it has volcanoes. Areas on the Moon overlain by volcanic flows were given the Latin name for "sea," *mare* (plural *maria*), because these smooth, low, dark plains looked like oceans to Galileo Galilei. The maria are striking in contrast to the brighter, more rugged highlands, or *terra*. Before Apollo, a variety of theories

In this NASA photo taken by the *Galileo* spacecraft (above), you can see several lunar maria: Oceanus Procellarum (on the left), Mare Imbrium (center left), Mare Serenitatis and Mare Tranquillitatis (center), and Mare Crisium (near the right edge).

about the origin of the lunar maria flourished: they were thought to be dried-up riverbeds, huge bowls of dust, flows of volcanic ash, or melted material ejected from the largest impact craters. However, when the rock samples from Apollo 11 were analyzed, they showed conclusive proof that the Moon—and the maria—resulted from fiery beginnings.

Scientists like me still study these rocks, investigating their mineralogy and chemistry, to unlock the composition and geological evolution of the Moon. Such research has revealed that the Moon may have formed from material knocked off when a Mars-sized asteroid hit the Earth. As this debris came together, the multitude of collisions released enormous energy, causing a global melting of the Moon. This produced a molten ocean where dense minerals sank (minerals that later remelted and produced the maria) and less dense minerals floated (the materials that formed the terra), creating a mineral layer cake. Subsequent impacts to the Moon's surface fractured its crust, providing conduits for magma to rise, fill the impact basin, and form the maria.

These hypotheses are only a few pieces of the puzzle needed to fully understand the Moon; many more challenges and adventures still lie ahead in lunar geology. For instance, the information I gather from my research of the compositional diversity of volcanic flows may help to determine the composition and history of the Moon's interior. That potential to advance our understanding of the origin and geologic evolution of the Moon—and the Earth—is what makes working in this field incredibly exciting and satisfying.

***Jeff Gillis** is a postdoctoral research associate in the Earth and Planetary Sciences Department at Washington University. He earned degrees in geology from Amherst College (B.Sc.) and Rice University (Ph.D.). In his spare time, Jeff enjoys scuba diving, rock climbing, hiking, camping, and just being outdoors. In this photo, he's hiking on the Franz Josef glacier in New Zealand.*

In seeking to understand the rupture process that occurs during an earthquake, these researchers saw their work take on an added dimension: getting vital information about earthquakes to response and rescue crews.

Seismology

by David J. and Lisa A. Wald

As seismologists, we find that living amidst the seismic activity in southern California is ideal. And as if that weren't enough, we also live directly on a fault. We are plenty busy between earthquakes, but when an earthquake happens, our jobs get really exciting!

Seismology is the study, by both natural and artificially-generated seismic waves, of earthquakes and the structure of the earth. Because the earthquake process and the earth structure are so complex, seismologists typically choose one or several related aspects of the earthquake process or earth structure to study in detail.

Our particular focus is on the actual rupture process during an earthquake, which involves modeling the location of the beginning of the rupture and its progress across the fault surface. We have also investigated different methods of estimating the amplitude of shaking at a particular location. Results from both of these studies can be used by other scientists to model additional aspects of the earthquake phenomenon, and by engineers to aid in building structures that can better withstand the shaking from an earthquake. As an outgrowth of our research, we have most recently been developing ways to get important information as quickly as possible to those who can use it after a damaging earthquake.

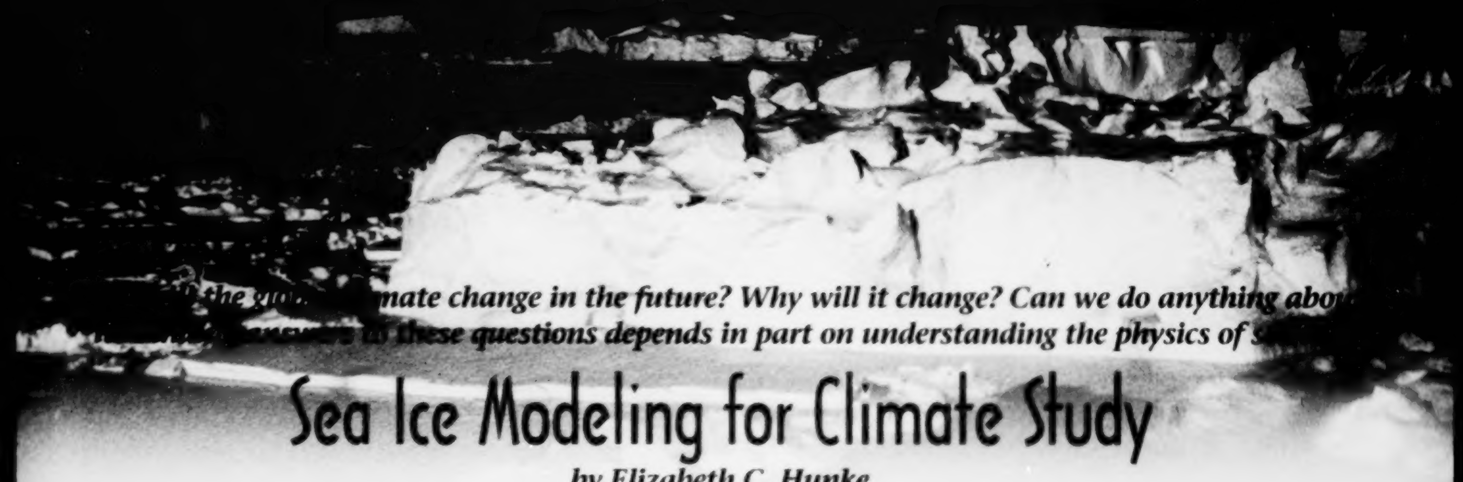
The U.S. Geological Survey (USGS) office in Pasadena and the Seismology Laboratory at Caltech jointly operate the Southern California Seismic Network. For about a decade now, the location and magnitude of earthquakes have been available within minutes via pagers carried by scientists and emergency response personnel, and more recently on the Web. Until a couple of years ago, however, the distribution of shaking from an earthquake, which is directly related to the distribution of damage, was still initially a mystery, brought to us mainly by people calling radio stations to share their earthquake reports. We have been working on a fast and reliable method for providing that most critical information: where did it shake the most in the earthquake?

One method we have developed is called "ShakeMap," which shows the distribution of shaking and intensity of an earthquake. The data used to produce these maps is automatically collected from seismic instruments across southern California and received at a central processing site. These maps are available within minutes following an earthquake.

The ShakeMaps work well in areas that have many sensors in place to monitor earthquake activity, but in areas where earthquakes are less frequent, this is not the case. In these areas, Community Internet Intensity Maps (CIIM) are produced by collecting shaking and damage reports from Internet users immediately following a southern California earthquake. The information is then used to generate an intensity map that shows the distribution of shaking and damage as reported by the people who experienced the earthquake. The map automatically updates every five minutes to reflect new responses.

Both types of maps can aid in rescue and response efforts where there would otherwise be no information. We hope to expand the use of the ShakeMaps to other seismic networks and to expand the use of the CIIM nationwide. In the meantime, we keep our fingers crossed that the next earthquake is not on the fault directly under our feet.

***David and Lisa Wald** are both geophysicists at the U.S. Geological Survey in Pasadena, CA. David likes mountain biking and homebrewing; Lisa likes reading and music; and they both enjoy camping.*



[illegible] the glo[illegible]mate change in the future? Why will it change? Can we do anything abo[illegible]
[illegible] answers to these questions depends in part on understanding the physics of s[illegible]

Sea Ice Modeling for Climate Study

by Elizabeth C. Hunke

Even though sea ice occurs only in the polar regions, its effects are felt globally: if sea ice disappeared or its governing physical processes changed, currents around the world could change, thereby altering the climate. Sea ice plays this dramatic role in the climate system for several reasons. For example, a layer of sea ice just half a meter thick reflects much of the incoming sunlight back to space and prevents heat stored in the ocean from reaching the atmosphere. This keeps air temperatures low, allowing more ice to form. Additionally, as ice forms, its crystalline structure rejects salt, so new ice is much fresher than sea water. As wind and ocean currents move sea ice over long distances, fresh water is transported across the ocean surface. This freeze/drift/melt cycle is believed to be an important mechanism driving the global oceanic circulation.

> “Understanding why the climate may change will allow us to deal with those changes more effectively.”

These are only a few of the many physical issues that a sea ice model needs to address. As an applied mathematician, I am trained in fields ranging from basic numerical and computational techniques to physics to abstract mathematical analysis, all of which I use in my daily work modeling sea ice. As part of the Global Climate Modeling effort at Los Alamos National Laboratory, I am trying to understand the role of sea ice in the climate system, particularly how the ice interacts with the atmosphere and underlying ocean. This requires a basic understanding of sea ice physics, which can be described using mathematical equations. Solutions of these equations predict melting and freezing rates, for example, or the speed and direction of moving ice floes.

My colleagues are developing similar models for other components of the climate system, such as the atmosphere, ocean, and land surface. Together, these components form a comprehensive model of the Earth's climate system. To produce a simulation of the climate, all of the model equations are solved simultaneously on powerful parallel computers.

Once the models produce a valid simulation of the Earth's current climate, we can alter certain elements (such as atmospheric carbon dioxide levels) to learn how the climate may change in the future. Climate components interact in ways that are complex and difficult to predict; our numerical models enable us to analyze numerous processes in order to determine which are most important for regional climates as well as the global climate. Understanding why the climate may change will allow us to deal with those changes more effectively—by altering manufacturing methods, for example, or by moving populations, such as those in coastal areas likely to become more frequently threatened by hurricanes.

Such an effort requires a great deal of cooperation among scientists and institutions. Modelers like me need physical data and insight from field scientists, technical support from computer scientists, and close collaborations with fellow modelers in order to tackle such a huge problem. In a major collaborative effort, the ocean and sea ice modeling team here in Los Alamos is working with scientists at the National Center for Atmospheric Research in Boulder, Colorado, on multicentury climate simulations that utilize models, computers, and expertise at both institutions. While we continue to improve the models' physical parameterizations, the greatest challenge lies in further understanding interactions among the climate components. With a coupled atmosphere-ice-ocean-land model, we will be able to thoroughly explore these processes as we heighten our understanding of the climate system.

In January and February 1998, Elizabeth visited Antarctica to record measurements and take core samples of sea ice. The photo above shows several small icebergs and sea ice.

***Elizabeth Hunke** earned a B.S. in applied mathematics from Memphis State University and a Ph.D. in applied mathematics from the University of Arizona, where she studied the dynamics of tropical cyclones. When she's not simulating sea ice, Elizabeth enjoys hiking, cooking, and honing her skills as a private pilot. She also plays the French horn in two orchestras, two quintets, and two brass bands.*

DETECTING TORNADO-STARTERS

by Jay Michaels

Have you ever heard the word "misocyclone"? Probably not. Don't worry—even some professional meteorologists are not familiar with this term. So how do I know about it?

It all started in 1995, when my family moved from Massachusetts to Florida. We soon found out how stormy the "Sunshine State" can be: just a few weeks after we had moved, Hurricane Erin made landfall on Florida's coast. Although the winds didn't make it above 75 miles per hour where we live, I was spellbound as the winds gusted and power lines exploded in the dark. I was hooked on weather—especially severe weather.

By the summer of 1996 I had become an unofficial student intern and storm spotter at the National Weather Service (NWS) office in Melbourne, Florida. There, I learned how to interpret weather charts, relay weather information over the National Oceanic and Atmospheric Administration weather radio, and analyze Doppler radar. In 1998, still interning at NWS and with the help of people there, I began a science research project on tornadoes. It was in performing that research that I first encountered misocyclones.

Small Rotations ... Huge Potential

Meteorologists use sensitive tools, such as Doppler radar, to detect strong thunderstorms and tornadoes. Often, tornadoes are detected before they reach the ground, giving people a chance to get to a safe place. Other times, though, tornadoes evade detection. Sometimes the thunderstorms that spawn tornadoes look very unimpressive on Doppler radar; but these small thunderstorms can produce small tornadoes that, while difficult to detect, are strong enough to damage buildings, uproot trees, and lift automobiles.

Around 1980, Dr. Theodore Fujita discovered that weak thunderstorms often contain weak rotations of air, which he called "misocyclones"—"miso" meaning small, and "cyclone" meaning rotation.

Although misocyclones are just a thunderstorm feature and do not always lead to more severe weather, they can create one of two dangerous weather situations. In the most common, the misocyclone acts as a channel for strong winds, which can range from 40 to 80 or more miles per hour. The more rare—and dangerous—effect of these weak rotations is the formation of "weak" tornadoes (which by definition have winds of less than 150 miles per hour).

Doppler radar allows weather forecasters to detect air motions inside thunderstorms, so many advances have been made in the ability to warn people of tornadoes. But more research is still needed, and that's where I came in.

Seeing Weather Through a Jeweler's Glass

Because detecting misocyclones might be able to help meteorologists forecast tornadoes, I decided to focus my research project on them. The first step was to find

The leading edge of a thunderstorm (a gust-front), where misocylones most frequently occur. The arrow may point to a misocylone in the gust-front.

out what research the professionals had already done. After looking through numerous books and papers, I found only 10 or so written studies—all very short—concerning misocyclones.

Step two, then, was to get data, which was donated by the National Climatic Data Center in North Carolina. This data consisted of more than 120 color pages of radar images. I gathered additional data by looking through actual reports of tornadoes in the Central Florida Region.

The final step was to analyze these pages with a jeweler's glass in order to extract all the fine details that a radar image holds. This took a long time—I spent up to three hours looking over a single radar image. Once the research was done, I compiled the results and the study into a report. The final report was more than 180 pages long!

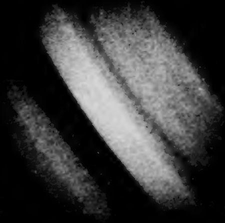
Gaining Sponsorship, Saving Lives

Largely due to the success of my project at science fairs, including a first-place win at the 1999 Intel International Science and Engineering Fair, many organizations have taken interest in my research and offered support. My current sponsors include the National Weather Service, the National Severe Storms Laboratory, the National Climatic Data Center, Cape Canaveral Air Force Station, the NASA Kennedy Space Center, and the Weather Channel. With the data and equipment these organizations provide, I'm studying how misocyclones may cause tornadoes during the summertime. I hope eventually to be able to document misocyclones on radar and to give them a formal and absolute definition. But my primary goal is to increase the time people have to prepare for a tornado.

There remains a good six months before my latest research will come to a close, so I still have a lot of work to do. I hope that by working alongside weather experts and by carefully analyzing storm data, I'll be able to help devise an efficient way to detect weak tornadoes. But the work of meteorology researchers won't be over until every hurricane, tornado, and thunderstorm can be well predicted. Until then, we will keep working to increase people's awareness and to save lives.

BEST COPY AVAILABLE

***Jay "the Weatherman" Michaels** is a senior at Cocoa High School (home of the Tigers!). If there is a thunderstorm, he will be on the roof of his house; otherwise, he'll be working on storm research or pursuing his other love, astronomy, with his computerized telescope.*



1. This planet, with its sunrises in the west and its sunsets in the east, is the only one in our solar system that rotates "backwards."

2. Which planet is considered a comet by some and a double planet system by others?

3. Seasons last for 40 years on this planet, where the winds blow faster than on any other body in the solar system (1,500 mph!).

4. This planet, which may have been tilted on its side by a collision with a planet-sized body, takes 84 years to orbit the sun.

5. Which five planets are visible from Earth without a telescope?

6. Besides Saturn, which planets have ring systems?

7. This planet has 16 moons, one of which is the most volcanically active body in our solar system.

8. The center of the core of this planet, which is the densest major body in our solar system, is hotter than the surface of the sun.

9. Temperatures on this fastest-moving planet (29 miles per second!) range from 700 degrees to -300 degrees Fahrenheit.

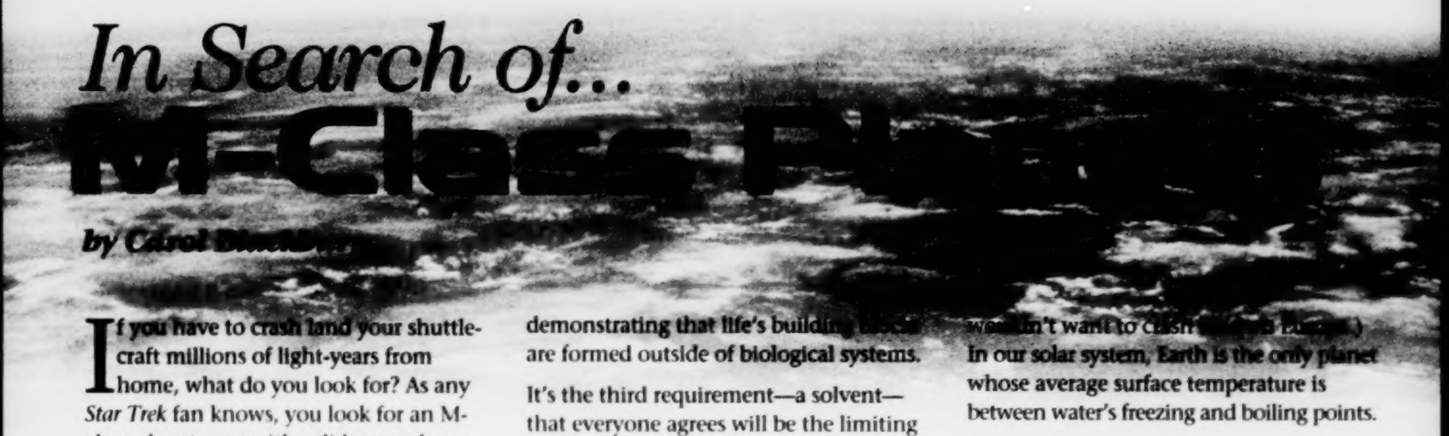
10. This planet has not only the largest volcanic mountain in the solar system but also an enormous canyon system that's as long as the U.S. is wide.

11. What are the four terrestrial planets?

12. What are the four gas giants?

Answers:

1. Venus 2. Pluto 3. Neptune 4. Uranus 5. Jupiter, Mars, Mercury, Saturn and Venus 6. Jupiter, Neptune and Uranus 7. Jupiter 8. Earth 9. Mercury 10. Mars 11. Mercury, Venus, Earth and Mars 12. Jupiter, Saturn, Uranus and Neptune



In Search of...

M-Class Pl[illegible]

by Carol [illegible]

If you have to crash land your shuttlecraft millions of light-years from home, what do you look for? As any *Star Trek* fan knows, you look for an M-class planet: one with solid ground, running water, and breathable air. Fortunately for Starfleet personnel, M-class planets don't seem to be a rarity—at least not in Gene Roddenberry's universe.

In 1995, scientists found the first hard evidence of planets outside our solar system. All of them are huge—Jupiter-sized gas giants massive enough to tug on their parent stars and make them "wobble" in place. Using current technology, that's the only way scientists can detect planets outside our solar system. They knew they'd never spot small, Earth-like planets with these methods. But the discovery of the first extra-solar planets fueled excitement about what scientists will find when their planet-hunting tools improve.

A decade from now, NASA will launch the first space-based telescope designed specifically to look for Earth-like planets. The Terrestrial Planet Finder (TPF) will use technology still in development to detect infrared emissions from planets—no mean feat, since the radiation given off by a planet is less than one millionth that of its parent star. The challenge has been likened to trying to spot the glow of a firefly within the glare of a searchlight.

The Bare Essentials

Just what will astrobiologists be looking for? What does life require? Raw materials, energy, and a solvent in which molecules can move around, bump into one other, and react to form more complex molecules. The raw materials for carbon-based life—carbon, hydrogen, oxygen, and nitrogen—are common elements, so the first requirement should be easily met. So should the second. Matter is exposed to all sorts of energy, from solar and cosmic rays to geothermal radiation. Indeed, amino acids have been found on meteors, demonstrating that life's building blocks are formed outside of biological systems.

It's the third requirement—a solvent—that everyone agrees will be the limiting factor. On Earth that solvent is, of course, water. But does it have to be? Probably. Water has many unique properties as a solvent, not the least of which is the temperature range at which it is a liquid. Other small, simple molecules like methane and ammonia are liquids at much lower temperatures, and chemical reaction rates plummet as temperature drops. Scientists are intrigued by the possibility that organic molecules may have formed in frigid seas of ethane on Saturn's moon Titan; but at Titan's surface temperature of -280°F, chemical reactions proceed more than a million times more slowly than they do on Earth. And that would have a decidedly chilling effect on the spontaneous generation of large, complex organic molecules.

> "The challenge has been likened to trying to spot the glow of a firefly within the glare of a searchlight"

Liquid water is thus the one environmental condition believed to be essential for life. This condition appears to have been met on two other bodies in our solar system, and both are now the focus of research and excitement. Geological evidence indicates that Mars once had liquid water on its surface; and recent data suggest that the icy surface of Jupiter's moon Europa conceals a subsurface sea of liquid water warmed by geothermal energy. The presence of even simple life forms on Mars or Europa would prove that life can develop in places other than Earth.

What Makes a Planet Hospitable?

Mars and Europa may meet minimum requirements for life, but neither is what you'd call hospitable. (You certainly wouldn't want to crash land on Europa.) **In our solar system, Earth is the only planet whose average surface temperature is between water's freezing and boiling points.**

The major determinant of a planet's surface temperature is its distance from its parent sun. The region around a star where planets could maintain liquid water is called its "habitable zone" (HZ). The location of a star's HZ depends on both its size and age. A larger star's HZ will be farther out than a smaller one's. A star's HZ also changes with time. As a star ages, its energy output increases and its HZ gradually moves outward. Earth has been fortunate to lie within our Sun's HZ for its entire history and will continue to do so for a few billion more years. But when the inner edge of the Sun's HZ reaches Earth, our planet may experience a "runaway greenhouse," as Venus did, resulting in the evaporation of the oceans and the end of Earth's age of habitability.

Location within the HZ is a necessary but not a sufficient condition to create a temperate environment on a planet's surface. For that, a planet must also have an atmosphere—a blanket that insulates it from the temperature extremes caused by solar heating alone. The "greenhouse gasses" CO_2 and water in our atmosphere absorb heat energy, trapping it before it can be lost into space. On the Moon, which receives the same amount of solar heating as the Earth but has no atmospheric blanket, the temperature careens from a daily high of 210°F to a nightly low of -300°F.

A planet's ability to have and to hold onto an atmosphere depends upon its distance from its sun and its mass. Mercury's location so near the Sun makes it too hot to have an atmosphere even if it were more massive, while the Moon, which lies within the Sun's HZ, has too little mass to hold an atmosphere. Mars is considered to be near the minimum size to retain an atmosphere for a long period of time.

And long periods of time are what's needed. Here on Earth, life may have arisen in as little as a few hundred million years, but it took 3.5 billion years for land-based life to emerge.

Beyond Mere Suitability

To give life time to evolve, a planet must offer an environment that is not only suitable but also fairly stable. Earth's fossil record shows how vulnerable life is to transient climate changes. Earth has had several extinction-level climate disturbances in which up to 95% of all living species were wiped out. Whether the catalyst for climate change comes from outside the planet (like a giant meteor impact) or from within (like a massive volcanic eruption), such events can make a planet inhospitable to life for thousands of years.

Yet Earth could have had many more catastrophic climate changes than it has. Earth has more going for it than just location and size. Scientists are still appreciating just how many factors have contributed to making Earth the haven for life that it is. Among them:

- *A meteor magnet.* During its first half-billion years, Earth experienced meteor impacts so powerful that they vaporized the oceans and sterilized the planet. Had Earth continued to receive such an assault from above, complex life forms could never have evolved. That early planetary pelting came to a natural end as the young solar system matured, but Earth owes its relative tranquility since then to its planetary big brother, Jupiter. With a mass well over 300 times that of Earth's, Jupiter has acted as the solar system's vacuum cleaner. Whether by capturing them and keeping them as moons, drawing them into its gravity well, or sling-shotting them out into space, Jupiter has cleared the solar system of much cosmic debris that might otherwise have collided with Earth.

- *Lots of pressure valves.* The decay of radioactive elements in the interior of planets creates heat that must be dissipated, which the terrestrial planets accomplish by volcanic activity. As heat is dissipated, the core shrinks, and the crust must do so, too. Earth is the only planet whose crust is in pieces—or tectonic plates—that move independently, sliding past, colliding with, or pulling apart from one another. This dynamic system creates thousands of energy release points all over the globe—earthquake fault lines, volcanoes, rift valleys—that dissipate internal energy without causing catastrophic climate changes. Planets with only one plate, like Venus, discharge internal energy in massive planetary events like enormous volcanic eruptions.

Only as other Earth-like planets are discovered and studied will we learn how important such features are in making a planet a home to life.

Signs of Life

So what will the TPF be looking for? For rocky planets located a suitable distance from suitable suns, with suitably large masses to retain an atmosphere. For signs of water in the atmospheric emission spectrum, indicating a watery planet.

And for oxygen. If liquid water is the sign that a planet is habitable, atmospheric oxygen is a sign that a planet may well harbor life. Geological processes alone could never have produced an atmosphere like Earth's.

Indeed, Earth only recently (geologically speaking) become an M-class planet. For most of its history, Earth's atmosphere was "unbreathable" for aerobic species like us. Life radically altered the composition of Earth's atmosphere. Only after photosynthetic organisms began to produce a global oxygen surplus, adding oxygen to an atmosphere that had almost none, did oxygen become available as a metabolic fuel, opening the gate for the evolution of aerobic species. Only then did Earth's ozone layer form, providing protection from DNA-damaging solar UV radiation. And only with that protection could life slowly crawl out of the sea and onto land, creating the lushly populated planet we know.

When the TPF finally brings us news of other planets circling other suns, perhaps it will find M-class planets like those that have populated our dreams and our science fiction ... and others we cannot yet imagine.

Supplemental Resources

Jakosky, Bruce. *The Search for Life on Other Planets.* New York: Cambridge University Press, 1998.

Science (Special section: "Planetary Systems"). 1 Oct. 1999, pp. 65-84.

Shapiro, Robert. *Planetary Dreams: The Quest to Discover Life Beyond Earth.* New York: Wiley & Sons, 1999.

Web resources:

NASA Origins Project
origins.jpl.nasa.gov

NASA Terrestrial Planet Finder
tpf.jpl.nasa.gov

NASA Exobiology
pokey.arc.nasa.gov/ssx/ssx.html

The Drake Equation
www.seti.org/drake-eq.html

The Planetary Society
www.planetary.org

Each year, approximately 4,000 volunteers join the efforts of Earthwatch, an international nonprofit organization that supports scientific research. In one- to three-week expeditions, volunteers are grouped with scientists to conduct fieldwork in any of seven interest areas that include endangered ecosystems, world health, and archaeology.

Our two writers took different paths to their Earthwatch expeditions. Lisa Ehrlich had heard positive reports from a friend who'd gone on an expedition and decided to do one herself; Jenny Fisher won a Student Challenge Award, which allows teacher-nominated students gifted in the arts and humanities to work with scientists on projects developed specifically for the Student Challenge Awards Program. To learn more about Earthwatch and SCAP, see www.earthwatch.org or call (800) 776-0188.

Tunnel Vision

by Jenny Fisher

As the plane touched down at Phoenix International Airport, I felt ready: Ready to find out exactly what the wind tunnel was, ready to work with real NASA scientists, ready to meet the five other Earthwatch students, and, most of all, ready to begin working on the Mars Data Analysis Project at Arizona State University (ASU).

Right away, we met the two scientists we were working with, Kim Homan and Kevin Williams. They soon showed us the wind tunnel, a large rectangular structure 40 feet long, 3 feet high, and 3 feet wide. Inside was a test section about 6 feet long that contained a scaled-down version of the *Mars Pathfinder* landing site. Every rock was exactly as it had been when the Pathfinder landed—same shape, same position—but one-sixth the size. There was even a miniature Pathfinder!

> “Our team took one of the first steps showing that a manmade object on the surface of Mars directly affects the Martian landscape”

The scientists at ASU had used this wind tunnel to re-create the features they had seen in pictures taken by the Pathfinder. Using the pictures and the wind tunnel results, they had determined that when these features were formed, the wind was blowing from the northeast to the southwest. However, when the Pathfinder landed, it conducted experiments that showed that winds were currently blowing in the opposite direction: from southwest to northeast. Our task was to predict how this present wind direction would affect the Pathfinder landing site and to see how the physical presence of the Pathfinder would change the formation of features.

To accomplish our task, we worked with Gary Beardmore, the wind tunnel guru. He had been working with the wind tunnel for several decades and had run hundreds of experiments on scores of test sites. With his help, we ran two types of experiments: depositional and erosional. For the depositional experiments, we blew sand through the wind tunnel at a set velocity and watched as it deposited itself around the model rocks. For the erosional experiments, we left the sand from the depositional experiments in place and blew only wind through the wind tunnel, allowing the wind to sculpt the sand. Both experiments were conducted with and without the Pathfinder model on the test site. Each experiment could take up to three hours, during which we continuously took photographs, made sketches, recorded observations, and fixed problems.

In all the variations of our experiments, numerous wind features formed. The most exciting result was the wind's reaction to the Pathfinder: the wind treated the Pathfinder like a big rock. Without the Pathfinder, the sand spread evenly throughout the test site. But when the Pathfinder was in place, the sand piled up in front of it and was very scarce behind it.

The scientists had expected these results but had never attempted to confirm them. Our team took one of the first steps showing that a manmade object on the surface of Mars directly affects the Martian landscape. Of course, our hypotheses can't be completely confirmed until we see the changes the real *Mars Pathfinder* causes. This could take months, or even years. It is likely that the wind direction will change before we can see if our predictions are replicated on the surface of Mars. Even so, our experiment made headway in showing that human interference on Mars is already changing its natural appearance. And the more landers and rovers we send to Mars, the more we will change the red planet's surface.

This summer I learned that my real interests lie in the planets. I want to know how our actions are affecting our solar system. I want to be able to predict the changes that human beings will make. Earth has been greatly altered by human activity, and as technology increases, the other planets will follow suit. We may even begin colonizing other planets! But before we begin sending humans to the Martian surface, I want to use and expand upon our research to make sure everyone knows exactly what kind of an impact we are already making in outer space. And I want to be the one to tell them.

***Jenny Fisher** is a senior at Arcata High School in Arcata, CA. A mallet percussionist in her high school orchestra, she also plays piano and sings. Jenny hopes to pursue a career in mission control at NASA.*

MARS AT EARTHWATCH

Land of Fire and Ice

by Lisa Ehrlich

I turn and steal a last look at the mountain of pure ice sloping up behind me, and with a final glance say goodbye to my home for the past two weeks. My time in Iceland has been spent on and around the Skeidarárjökull glacier in Skaftafell National Park in southeast Iceland. Iceland, though not completely covered in ice as its name suggests, does have three major ice caps, including the largest one in Europe, Vatnajökull. This ice cap gives birth to many glaciers in the surrounding valleys, the largest of which is Skeidarárjökull, the subject of my research.

I arrived in Iceland as part of an Earthwatch expedition. My group was aiding scientists from three different universities who were each conducting research on the glacier. Ultimately, their work will not only help engineers to construct safer roads and bridges but also shed light on the glaciers' role in the global climate system. I worked for three days with each of the three researchers and explored Iceland on the days off.

During the first three days of fieldwork, I helped investigate the record of volcanic eruptions hidden in the ice. Under the dome of the Vatnajökull lies one of the world's most active volcanic zones. When these volcanoes erupt, they burst through their covering of ice and spray large amounts of tephra, the solid material ejected during an eruption. This tephra is then covered by snowfall, and as the snow is compressed into ice and becomes part of the glacier, the tephra is trapped. As the glacier slowly advances and begins to melt, the tephra is exposed, providing a timetable of all the past eruptions. Our group located, catalogued, and sampled tephra bands for further analysis back in England.

My next project focused on another part of the glacier: the outwash plain at its base. We collected data that would help to show whether normal river movement or large flash floods were the main force in shaping the outwash plain. We learned that a river tends to roll rocks along their shorter axes while a mass flow caused by a flood will tend to push them along by their longest axes. By measuring the stones, we could determine which axis they had been moving along, which then allowed us to determine what type of flow had placed them in their present position.

In the final project, I turned my attention to floods and floodwater escaping from the glacier. When volcanoes under the glacier erupt, they melt large quantities of ice, which then travels underneath the glacier until it can escape as a massive flood at the margin. Previously, scientists believed that this massive amount of flood water traveled through pre-existing subglacial channels. But we found significant evidence that during a flood, water actually fractured the glacier and poured through the resulting large cracks in the ice.

This Earthwatch expedition gave me not only a new knowledge of glaciology and the landscape of Iceland but also the invaluable experience of participating in a real, active scientific research project. And while I learned that research is not always as glamorous as I had imagined—counting stones can get a bit tedious—I developed a deep respect for the scientific process and those who devote their lives to study. As I stepped onto my flight home, I felt immense satisfaction knowing that the work I had just completed would further scientists' understanding of glaciers.

*A senior at Taft School in Watertown, CT, **Lisa Ehrlich** enjoys skiing, climbing, and backpacking. This year she is taking a class in environmental science to further her studies of the Earth.*

EarthKAM
(formerly KidSat)
EarthKAM, c/o CalSpace Institute, 9500 Gilman Drive #0426, La Jolla, CA 92093; ek-help@earthkam.ucsd.edu; www.earthkam.ucsd.edu/contact/

Through this NASA-sponsored program, middle school students take photographs of the Earth from a camera aboard the Space Shuttle. After using interactive Web pages to target images, students use the images in classroom projects to learn about Earth science, geography, mathematics, and space science.

Global Learning and Observations to Benefit the Environment (GLOBE)
GLOBE, NASA Ames Research Center, Moffett Field, CA 94035; www.globe.gov

Working with their teachers, students in grades K–12 measure air temperature, precipitation, water temperature and pH, and other environmental parameters, then send their results to the GLOBE Student Data Archive via the Internet. This data is used by scientists, and images based on this data are available on the GLOBE Web site.

The Mars Millennium Project
www.mars2030.org

This national arts, science, and technology initiative challenges students to design a community for 100 people arriving on Mars in the year 2030. Working in teams, students design a livable and life-sustaining community on Mars that is culturally and artistically rich. You can download a participation guide on the Web site. Entries must be submitted by June 1, 2000.

NASA Student Involvement Program
NSIP, TERC/Center for Earth and Space Science Education, 2067 Massachusetts Avenue, Cambridge, MA 02140; info@nsip.net; www.nsip.net/key.html

NSIP encompasses a variety of team, class, and individual research projects for students in grades 3–12. Students submit entries in one of five categories: Design a Mission to Mars, Watching Earth Change, Earth Systems in My Neighborhood, Aeronautics & Space Science Journalism, and Flight Opportunities. Prizes for winners in each category for each grade level (3–4, 5–8, and 9–12) include a school visit by a NASA representative, a paid trip to Space Camp, and an all-expenses-paid trip to the NSIP National Symposium for Center winners. Entry deadline: February 1, 2000.

Embrace Space

Space Day 2000
www.spaceday.com

A national celebration of space and our fascination with it, Space Day events include Web casts, exhibits, electronic fieldtrips, and countless events at the local level. Space Day 2000 will take place on May 4. Visit the Web site for continually updated information.

In addition to all the information you'll find on this site, you'll encounter some truly fun pages. Check out *Mission: Fun* for 101 Ways to Embrace Space, Brain Warp, and, if you've got the latest version of Shockwave, Planet Surfin', The Phaser, and Night Watchman. You can also send Postcards from Space to all of your friends.

THE PLANETARY SOCIETY'S RED ROVER PROGRAMS
Red Rover, The Planetary Society, 65 North Catalina Avenue, Pasadena, CA 91106-2301; (800) 969-MARS

Red Rover Goes to Mars
rrgtm.planetary.org/

Want to work on a Mars mission ... before you graduate from high school? Then enter either the Student Scientist Essay Contest (deadline: June 15, 2000) or the Student Astronaut Candidate Journal Contest (deadline: March 1, 2000). Winners of these contests will become part of the Red Rover Goes to Mars team, operating equipment on Mars or, as backup members, serving as media representatives.

Red Rover, Red Rover
redrover.planetary.org

Students design a rover, create a Mars terrain, and teleoperate the vehicle in their own classroom. Or, by linking to other classes' terrains via the Internet, students can teleoperate vehicles hundreds or thousands of miles away, simulating the challenges experienced by real NASA scientists.

BEST COPY AVAILABLE

SPACE SETTLEMENT DESIGN CONTESTS

NASA Ames Research Center Space Settlement Contest
NASA Ames Research Center, Attn: Al Globus, MS T27A-1, Moffett Field, CA 94035-1000; (415) 604-5000; globus@nas.nasa.gov; www.nas.nasa.gov/Services/Education/SpaceSettlement/Contest/contests.html

Individuals, teams of up to five, and whole classes may enter this annual contest for 6th–12th graders, in which students design permanent orbital colonies (not colonies on a planet or moon). See the Web site for examples of past winning entries. Entry forms and submissions are due by March 31.

International High School Space Settlement Design Competition
Space Settlement Design Competitions, c/o Anita Gale, 7888 Rainbow Circle, Huntington Beach, CA 92648; (562) 922-4066; anita.c.gale@boeing.com; space.bsdi.com/index.html

This contest for teams of high school students is conducted in two phases. In Phase 1, teams, acting as companies seeking to win a contract to build the space settlement, create and submit a design for a space settlement. The eight best submissions go on to Phase Two, the International Finalist Competition at Kennedy Space Center, where the finalist teams are paired to form four competing companies. There, with assistance from real working engineers and managers, the four teams seek to write the winning proposal.

SPACESET Space Settlement Design Competition For High School Students
SPACESET, M/S 249-EXP, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109; (626) 447-8694; home.earthlink.net/~spaceset/index.html

Similar to the International Space Settlement Design Competition, SPACESET challenges teams of students to draft proposals for the creation of an orbiting settlement. But SPACESET is different in that it takes place in a single weekend, and the teams are assembled at JPL. Dates for SPACESET 2000 will be available in February; sign up on the Web site to be placed on the mailing list.

BOOKS

The Cambridge Planetary Handbook by Michael E. Bakich (Cambridge University Press, 1999).

Earth Story: The Shaping of Our World **by Simon Lamb and David Sington (Princeton University Press, 1998).**

The History of Earth: An Illustrated Chronicle of an Evolving Planet by William K. Hartmann and Ron Miller (Workman Publishing Company, 1991).

Our Worlds: The Magnetism and Thrill of Planetary Exploration by Alan Stern (Cambridge University Press, 1998).

The Planets **by David McNab and James Younger (Yale University Press, 1999).**

The Universe Below: Discovering the Secrets of the Deep Sea by William J. Broad (Touchstone Books, 1998).

Venus Revealed: A New Look Below the Clouds of Our Mysterious Twin Planet **by David Harry Grinspoon (Perseus Press, 1998).**

Volcanoes: Crucibles of Change **by Richard V. Fisher, Grant Heiken, and A. K. Morris, ed. (Princeton University Press, 1998).**

ASK AN EXPERT

Be sure to check the list of questions already asked before posting your query to:

Ask an Astronaut
www.askanastronaut.com

Ask a Geologist
walrus.wr.usgs.gov/docs/ask-a-ge.html/

Ask Space Scientists Online:

About Mars
quest.arc.nasa.gov/mars/ask/question.html

About Saturn
quest.arc.nasa.gov/saturn/qa/

Ask a Volcanologist
volcano.und.edu/vwdocs/ask_a.html

Ask a Space Scientist
image.gsfc.nasa.gov/poetry/ask/askmag.html

ORGANIZATION WEB SITES

Once you arrive at these sites, spend some time exploring. You'll find images of and information about all things planetary. Links to these and many others appear on the *Imagine* Web site: *www.jhu.edu/gifted/imagine*

Lunar and Planetary Institute
cass.jsc.nasa.gov/lpi.html

The Meteoritical Society
www.uark.edu/campus-resources/metsoc/index1.htm

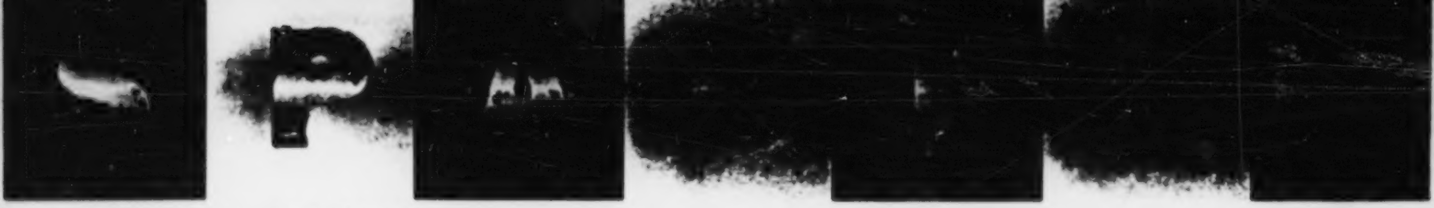
National Space Society
www.nss.org

National Weather Service
www.nws.noaa.gov

NASA
www.nasa.gov

The Planetary Society
planetary.org

U.S. Geological Survey
www.usgs.gov



by Katherine Yakubisin

Many people dream about being an astronaut: going up in the shuttle, living in space, being part of NASA missions. Well, for five days this summer, I got to live that dream. No, I'm not an astronaut. And I didn't have to go any farther from home than Huntsville, Alabama, one of the four sites of the U.S. Space Camp.

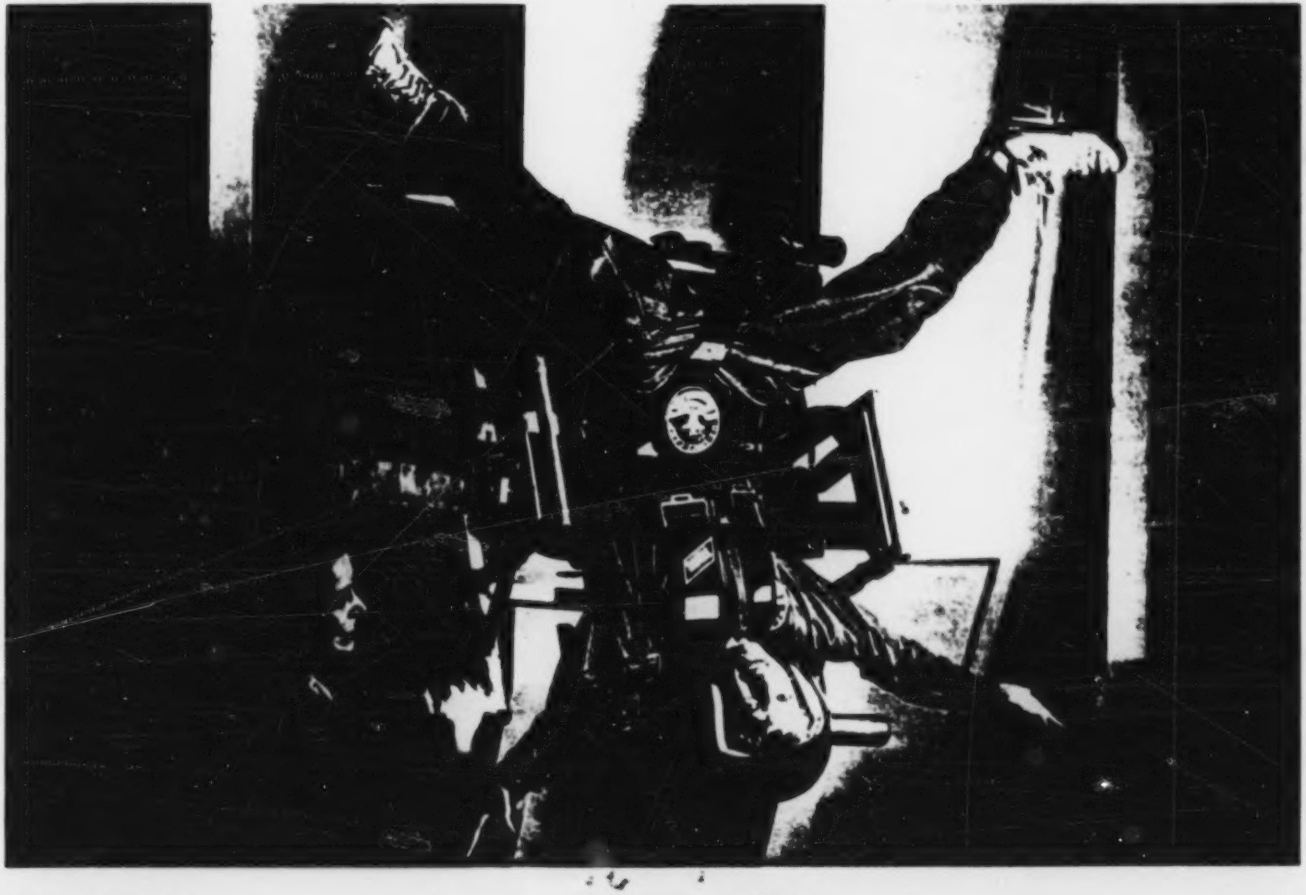
Space Camp was the last place I had expected to go this summer. My best friend Abby, who will undoubtedly be the first person on Mars, invited me to attend high-school level Space Camp, called Advanced Space Academy (ASA), with her. I had fun when we went to middle-school Space Camp during the summer after sixth grade, so I accepted. I knew Space Camp was fun, but when I signed up for ASA, I had no idea what a challenging experience I was in for.

New Camp, New Challenges

One way that ASA differs from the middle-school program is that each participant chooses one of three specialty tracks: Pilot, Mission Specialist, or Payload Specialist. Payload specialists are the most science-oriented people on missions. They manage experiments done in space and work as the doctors and trouble-shooters on missions. I love science, so this is the track I chose. Through lectures and films, I learned about common illnesses associated with space travel like severe motion sickness and nervous breakdowns from the confinement. We also spent time learning some basic laws of physics so that we would be able to address problems like pressure changes or mechanical errors when communications with mission control are out.

In between lectures and films, we also got to do some really cool activities. One of my favorites was working in the SCUBA tank. This was nothing like any SCUBA diving I've ever done. From a mock-up of the International Space Station that rests 24 feet under water, I deployed a satellite and ran through common procedures like changing oxygen flow from one hose to another. The purpose of the SCUBA activity is to learn how to work in a micro-gravity environment, so we had to walk

U.S. Space Camp "5 Degrees of Freedom" Simulator



on the bottom without fins. In water, when you push off the bottom, you quickly float away—but you can regain control of your body's motion. In space, you can't control your direction once you've begun floating, so it's important to learn how to use stationary objects to avoid floating away into space.

Although it's less directly related to space missions than working in the SCUBA tank, building models is one of the most popular activities at ASA. We did two different types of model building. Using virtual reality, a partner and I designed a Mars rover, which we raced against other teams'. During the simulation, we took turns driving the rover while the other person sat in the back using the rover's arm to pick things up. To race successfully, we had to learn how to coordinate our movements.

The model rocket building didn't work out quite as well for me. I'm not much of an expert on model building, so when it came to designing a rocket with the other members of my specialty track, I just followed their lead. When we finished, our model looked great. But at the launch, the rocket traveled two feet before making a nosedive right into the dirt. Oh well. You win some, you lose some.

Mission Accomplished

The week-long program culminates in a six-hour extended duration mission, or EDM. During this mission we simulated a space shuttle launch, orbit, and landing. We practiced for this with a series of three one-hour mini-missions. During these missions, we learned how to resolve routine problems, called "buzzer anomalies." From time to time, a buzzer would go off and we had to contact mission control to find out how to solve the problem. This might require turning on the correct oxygen tanks, adjusting the interior pressure, or changing the carbon filters. During the missions, we also ran science experiments—everything from making polymers to running physical and psychological tests on each other. We also learned how to prioritize our tasks so that when short on time, we could get the most important things done while still launching and landing safely.

The highlight of the week was definitely the EDM itself. This six-hour unscripted mission is a special privilege for ASA participants. Rather than a script as in the shorter middle-school Space Camp missions, we were given only a checklist of tasks that we had to finish while orbiting. Some of us went up on the orbiter; others remained in mission control.

During the mission, we had to deal with three different types of unexpected problems: buzzer anomalies, medical anomalies, and thinking anomalies. The buzzer anomalies were the same as in the one-hour missions, and easily solved. The other two were more challenging. At one point, everyone but one boy was sick (we simulated illness by acting out the symptoms listed on cards given to [illegible] staff), and he had to diagnose the [illegible]es, give the proper treatment, [illegible] mission control when other problems came up. At another point in the mission, a buzzer went off, but the camp [illegible] taken mission control off-line. Th[illegible] classic thinking anomaly. After waiting [illegible] minutes for a response, we [illegible] mission control, but the [illegible]

Continued on page 35

Katherine Yakubisin *spends much of her free time playing soccer. She's currently a sophomore at Sycamore High School in Cincinnati, OH, and hopes to attend the University of Virginia, where she will prepare for a career in clinical psychology, marine biology, or space exploration.*

TO LIVE BY THE SWORD:

MODERN SPORT FENCING

by Dara Weinberg

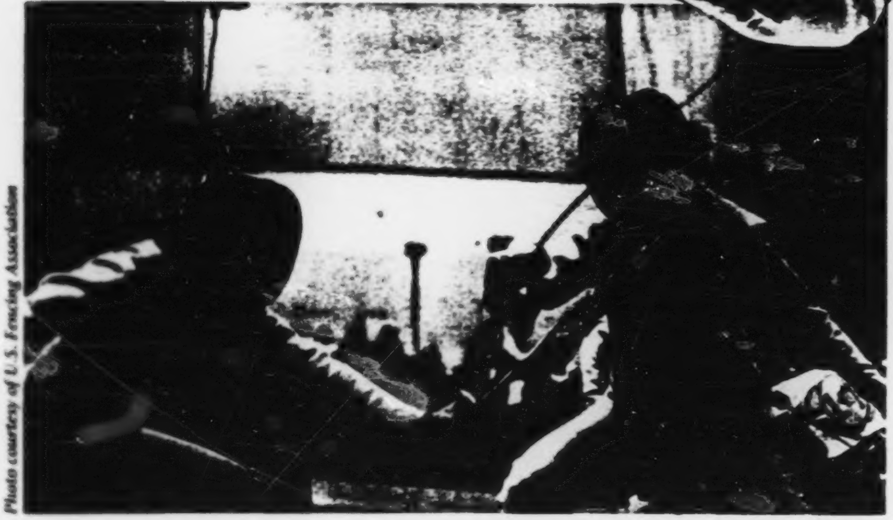


Photo courtesy of U.S. Fencing Association

The Myth

The lone traveler walks to the edge of the barren cliff. The sun sets behind him. At his right hangs his trusty broadsword, Bluefire, inherited from his grandfather. Bluefire was forged by the Dwarves who live beneath the earth in dark caverns. She is a Blade that cannot be Broken.

Swoosh! Swash! Buckle! D'Artagnan, Porthos, Athos, and Aramis draw their sabres in preparation to take on the Cardinal's men once more. The Musketeers fend off five thousand attackers.

Luke draws his glowing blade to combat Darth Vader. The lightsabers clash above and below their heads while the Emperor laughs demonically in the background. Luke executes a dramatic flip, catches the blade, and defeats his attacker.

If any of these myths sound familiar, you are somewhat acquainted with the sport, art, and tradition of fencing. Many people are aware of fencing in the historical sense, when swords were used as weapons on the battlefield. Fewer people know that today, while other weapons replace the sword, fencing lives on—and is growing in popularity—as an art and a sport.

The Art

I began fencing at a summer drama camp when I was ten. We were introduced to the basics of swordplay in a noncompetitive, theatrical setting. Theatrical fencing is concerned more with style than with combat; the goal is not to accumulate points but to provide a good performance. Duels are choreographed exactly, much like dances, and any deviation from the set moves is dangerous.

We were preparing for a performance of *Twelfth Night*, and I was assisting at the crucial duel between Sir Toby Belch and Sebastian. We rehearsed the duel—every thrust (attack), parry (block), and feint (false attack to distract your opponent from the real, upcoming attack)—until we were blue in the face. For reasons of safety, blocking, and plot, the actors had to begin and end up in exactly the same places every time. I enjoyed theatrical fencing so much that I sought out the fencing team at my high school, several years later.

The Sport

The first practice was an unpleasant shock for me. I had been one of the best and most creative theatrical fencers at camp, but my skills in choreographed battles were of no use in the sport. I soon learned that form was more important than melodrama in a sport fencing match and settled down to repetitive drills.

We broke the moves of fencing into basic increments. If you watch a fencing match, or bout, you might see one fencer move forward and attack, while the other tries to block the attack, counterattack, and score. This happens very quickly. It all seems like a fluid movement, but the feet and sword arm move in exact, precise steps towards the goal. For example, to attack well, you must be able to advance, which means taking one step in the correct manner: first right foot, then left, in a little shuffling sashay move towards the opponent. We practiced advance and retreat for hours before we were allowed to incorporate them into the context of a bout.

A fencing bout lasts for either five or fifteen touches. Each time you hit your opponent on-target, at the right time, according to the rules of right-of-way, you score a touch. The rules for scoring are different for each of the three main weapons in sport fencing: foil, sabre, and epée. Since each weapon requires a different strategy, fencers will usually focus on a single weapon in their training. I stuck with foil because, at my school, there was only a women's foil team, no sabre or epée.

We had practices twice a week until the first tournament. I was one of only three female fencers at my school. During endless drills and lengthy bouts, I felt like the only beginner in a sea of experts. But we needed three girls to make up the team, which meant that I would fence in the next tournament, ready or not.

The Reality

Knights had squires to help them prepare for tournaments. I had to get into foil gear without any help—no easy task. Foil gear is white pants with suspenders, white socks, sneakers, plastic Xena-the-Warrior-Princessesque breast protectors, an underarm protector, a canvas jacket, a mesh (electric) jacket, a metal mesh helmet, gloves, and an electric body cord. After plugging the body cord into the little socket in the sword, I was finally ready to fence!

I remember my first bout only because it was over so fast. I lost 5-0 to a rival fencer. My experience in theatrical fencing was hurting me. I was approaching each bout as a preset piece: Okay, in this touch, I'll lunge, she'll parry, I'll counterparry and lunge again and score. But then my opponent would lunge first and screw everything up. In sport fencing, I was learning, you can't choreograph a fight before it happens. I had to learn to be a fighter, not a dancer.

"Girls, this is the slowest bout I've seen in 30 years of refereeing. Do you think you could pick up the pace a little bit?"

Something clicks. It's slow, agonizing and painful, but I start to see what Coach Katzoff was saying about strategy. My opponent always begins her attack with the same move. If I anticipate it, I can outsmart her. I score a touch. And another. Seven touches in a row using the same strategy and she hasn't caught on. She begins to parry my attacks, but I'm on an adrenalin high. I start to jump up and down in place, bouncing to maintain my energy. I am unstoppable. Every pause is unbearable. She is my enemy and I want to kill her. And I do. I won that bout 15-13.

"Touch. Bout."

We salute and shake hands. I'm smiling so big it hurts.

> **"** In sport fencing, I was learning, you can't choreograph a fight before it happens. I had to learn to be a fighter, not a dancer. **"**

However, sport fencing isn't much like a typical fight. You stop after every touch to hear the referee call it, so it's hard to keep up your energy level. Plus, competitive fencing is scored electrically, and equipment malfunctions stop a bout ... which takes me back to another memorable match.

My opponent's foil has broken—it won't register touches on my electric vest. The sharp round bruises from a day of fencing are tingling on my skin. I need to blow my nose. I've been waiting at the strip for 15 minutes while she searches for a functional foil. I am starting to wish that the foils were not foiled, so I could do some actual damage.

Finally, she returns. We assume our sweaty, painful En Garde positions. The ref calls "Fence!" and we begin the awkward dance of the swords. We are confined to a 6-foot-by-40-foot strip. We do not move from side to side, but only forward and backward. Advance. Retreat. Advance. Retreat. Lunge. Parry.

The ref calls "HALT!" We collapse and listen.

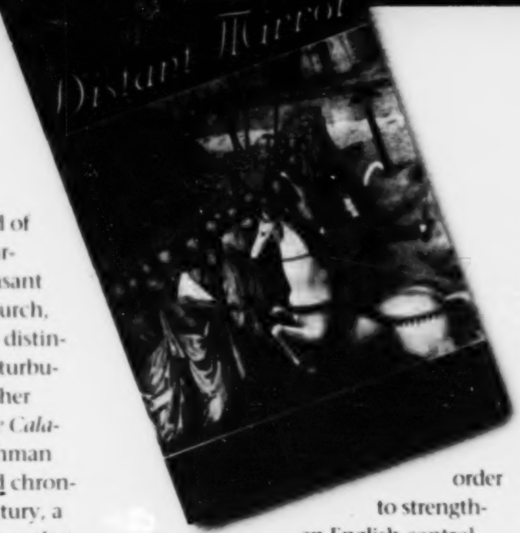
That was three years ago. I'm still not a very good fencer, but I enjoy the sport at the high-school level. I like fighting for the team and cheering on my friends. Fencers develop camaraderie and rivalries not unlike those of the King's Musketeers. You may not be fighting to save your land from the Vikings, but you care about the bout just as much as if everything were at stake. It's not everyone's sport; but for the driven masochists among us, it's a great way to spend Saturday mornings. So pick up a sword and get out there. But don't say I didn't warn you.

Visit the Web site of the U.S. Fencing Association at www.usfencing.org (especially the "New to Fencing" section) to learn more about the sport.

***Dara Weinberg** (if that's really her name) is a senior and a varsity-by-default women's foil fencer at Harvard-Westlake High School in Los Angeles. She enjoys history, government, and classics. In her spare time, she writes and directs plays, sings in her temple choir, and fights the Dark Side. You can contact Dara at lysistrata8@yahoo.com to talk about fencing, Herodotus, Aristophanes, or starting a literary and theatrical Renaissance in the new millennium.*

OFF THE SHELF

by Diane Clavier



The 14th century was a period of often violent transition. Characterized by bloody war, peasant uprisings, turmoil in the Church, and the nefarious Black Death, it distinguished itself as one of the most turbulent eras in European history. In her masterpiece, *A Distant Mirror: The Calamitous 14th Century*, Barbara Tuchman presents a fast-paced and detailed chronicle of Europe's last medieval century, a time marked by unwelcome change that came not by design but through a series of calamities.

Perhaps the most famous, or infamous, calamity of the 14th century was the Black Death. Rats carrying this dreaded disease entered Sicily from merchant ships recently returned from Crimea in 1347. The Plague was soon sweeping through Europe, leaving the populace demoralized by what they saw as punishment from God. In a series of outbreaks that continued to appear throughout the second half of the century, the Plague eventually killed over one-third of Europe's population. This reduced the supply of labor so greatly that the peasantry began to demand higher wages for their newly scarce services. Fearful of this new economic power, the noble and merchant classes fought wage hikes with laws and oppression that led to a series of bloody peasant revolts throughout the second half of the century.

The Plague is a running motif throughout Tuchman's book, but her primary focus is on the devastating Hundred Years' War (1339-1453) between France and England, started by Edward III of England shortly after the accession of Philip VI to the French throne. Edward III pressed his rival claim to the throne in order to strengthen English control over the Duchy of Aquitaine, but never expected over 100 years of fighting to ensue.

This long and tedious war left both nations impoverished by unprecedented taxation and kings more interested in battlefield glory than effective leadership. Worse for the average citizen was the rise of marauding bands who, having been brought together to fight indecisive battles, took advantage of the military and social instability to destroy, pillage, and murder at will. Strangely enough, however, this reign of chaos led people, particularly in France, to shift from local to national loyalties as they sought protection from the king.

As if the Black Death and the Hundred Years' War were not bad enough, the 14th century saw the breakdown of Europe's spiritual center: the papacy. Back in Rome after years of exile in Avignon, France, the college of cardinals, under popular pressure, elected Urban VI to replace the recently dead Gregory XI in 1378. Then this primarily French body quickly repudiated Urban and fled back to Avignon where they elected a new Pope: Clement VII. Each Pope, refusing to step down, excommunicated the other and all his supporters down to the parish level—an act that left nearly everyone in spiritual limbo. This schism severely damaged the credibility of the papacy, which would soon be irreversibly challenged during the Protestant Reformation and subsequent breakup of the Western church during the 16th century.

While reporting all of these misfortunes, Tuchman maintains a consistently lively and inviting style characterized by humor and attention to detail. In fact, the details can be a bit overwhelming at times. One must read carefully to keep track of the enormous cast of characters. But many of them—from the surly Charles of Navarre who spent much of his time poisoning his enemies to the flamboyant Amadeus VI, "the Green Count" of Savoy, who dazzled his acquaintances with his fabulous gifts and impetuosity in battle—are well worth keeping track of. Their actions often seem larger than life and are no less captivating than the most outrageous fiction.

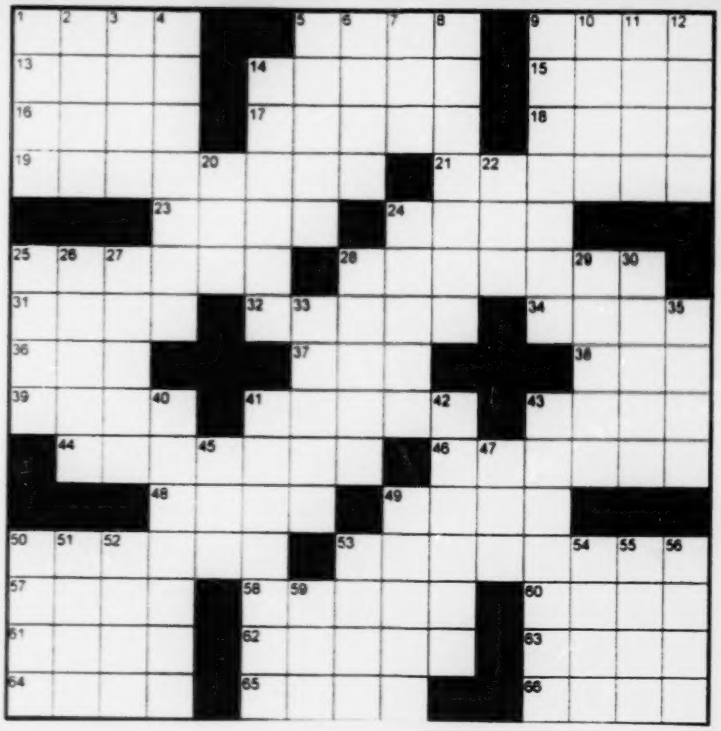
Best of all, *A Distant Mirror* is appropriate for nearly any reader who is willing to engage its 600 pages. It is a great resource for serious medieval enthusiasts and neophyte historians alike. I cannot imagine a more comprehensive picture of what was, in much of Europe, the last medieval century. If you know nothing about the Middle Ages, this book will give you a first-rate introduction to the era. If you're someone who devours books on medieval history, you'll find in this book a richness and clarity that will surprise, delight, and instruct.

Upcoming Book Review:

Verse & Universe: Poems About Science and Mathematics by Kurt Brown, ed.

Word Wise:

by Carol Blackburn



ACROSS

1 Kind of pear

5 Soothing substance

9 1,000,000,000,000 (abbr.)

13 Region

14 Grand Tetons, for example

15 __step

16 Harvest

17 -COOCH

18 Agent Mulder's obsession

19 Aurora __

21 Layer above the Earth's central core

23 May be dimpled

24 Cow, in Catalan

25 Intrude

28 Pertaining to earthquakes

31 Deafening

32 Narrow inlet between cliffs

34 *Dies* __ (Lat.)

36 Lassen National Park (abbr.)

37 Raggedy __

38 From the Greek "to arrange"

39 Thrust

41 Sleep disorder

43 Snic-__

44 Inadmissable evidence

46 Highest point

48 Representation (abbr.)

49 Yosemite's Half __

50 What glaciers do at the end of an Ice Age

53 Deepest ocean trench

57 Core element

58 Duplicate

60 1995 earthquake site

61 Fuzz

62 Blows

63 Always

64 Places protected from the wind

65 Sound

66 Assess

DOWN

1 Thorn

2 Cookie

3 Scorch

4 NE vacation locale and a terminal moraine (2 wds.)

5 River's drainage area

6 Earth aerators

7 Bigger than med.

8 Mythical sea creature

9 Earthquake-generated wave

10 Valley created where tectonic plates pull apart

11 Matinee __

12 __ *majesté* (Fr.)

14 Changes in altitude in an area

20 Exclamations

22 American Chemical Society (abbr.)

24 Mind-traveler to the center of the Earth

25 Evils

26 Lunar cycle

27 Chrysalis (pl.)

28 Cher's ex

29 Persian

30 Diamond weight unit

33 Home of over 80 volcanoes

35 Engrave

40 Arctic sea

41 Faces

42 Mid-Atlantic ridge islands

43 Keds product

45 Like Mars

47 Record company

49 Robotic volcanologist

50 Hadley __, Apollo 15 site

51 Great Lake

52 Volcanic feature

53 Titan or Miranda

54 Exploding star

55 Aid

56 Dried up

59 Mauna __

Solution on [illegible]4

Options:
Service

by Carol Blackburn

Foreign Service Officers represent the interests of U.S. citizens abroad, implement current foreign policies, and gather and analyze information that will shape future foreign policy decisions. ***Bill Martin****, a political officer in the U. S. Embassy in Prague, the Czech Republic, talks about this challenging career.*

How did you become interested in this career?

I attended junior high school in Washington, D.C., and several of my friends were the children of diplomats. They spoke foreign languages and had been to lots of places and done some really interesting things. It sounded like a fascinating life. In addition, my father was an Army officer stationed in Germany at that time, and I used to spend summers and vacations in Germany and traveling around Europe.

I also grew up in a family with a strong tradition of public service. My father was an Army officer; my grandfather worked

Bill Martin in Lahore, Pakistan, where he spent his first tour as a consular officer.

> “We are not brought in as specialists in a particular region or country; we are expected to work successfully in a lot of countries over the world and in a lot of different types of jobs.”

for the government as a mining engineer, stockpiling minerals during World War II; and my great-grandfather was an Army officer who died in World War I. I thought that the Foreign Service would allow me to combine my interest in international affairs with my desire for public service.

What did you study in college?

I double majored in history and German at Duke University and spent my junior year abroad in West Germany. That really confirmed that I wanted to do something international. I went on to study political science at Johns Hopkins University's School of Advanced International Studies, where I completed a master's degree in international relations and also studied international economics.

Does one need a master's degree in order to apply to the Foreign Service (FS)?

No, although if you want to pursue graduate work, you should do it before you apply. Most people who join the FS do have graduate degrees and do not go back for further graduate training after they join.

What are the requirements for applying to the FS?

The situation is a bit like that for premeds. It doesn't matter what you majored in as long as you've learned certain basics. You need to have preparation in U.S. and world history, politics, economics, and culture. But you don't need a degree in history or political science. There is also no language requirement in order to be admitted to the FS; but since intensive language training is a regular part of life in the FS, it's useful to be good at learning languages. If you do know a difficult language, like Japanese or Arabic, you are more likely to be able to influence where you are posted.

Application to the FS includes both a written and an oral exam. What they're looking for is breadth of knowledge, ability, poise, and resourcefulness. I would encourage students who might be interested in the FS to read *The New York Times* and *The Economist*, the two best publications for cultivating the approach to issues that the State Department is looking for.

What happens once you enter the FS?

My first two months were spent with 49 other fledgling Foreign Service Officers (FSOs) in FS basic training. We learned important things about how the State Department works and how to draft basic documents. We were also tutored in matters of protocol, like where to sit in an automobile and other diplomatic conventions. My first year continued with a two-month course on consular work and six months of intensive language training in Urdu, to prepare me for my first posting, as a consular officer in Lahore, Pakistan.

Was that a typical first posting?

Yes. Almost all FSOs spend their first tour as consular officers, to introduce them to many of the basic activities of U.S. embassies and consulates. I spent two years in Lahore, helping Americans in Pakistan and investigating visa applications from Pakistanis who wanted to visit the United States. Some people continue in the consular track, but that is only one of five possible specializations within the FS.

What are the five specializations?

Consular, administrative, economic, political, and public diplomacy. The consular track is perhaps the most people-intensive one. Consular officers are part lawyer, part social worker, part detective. They protect the interests of American citizens who travel or live abroad, in matters from replacing lost passports to safeguarding the legal rights of American citizens to arranging evacuations in times of crisis. They also approve visa applications, which includes investigating for potential fraud. They obviously need to have excellent interpersonal skills and good “instincts” about people.

Administrative officers' work is more behind-the-scenes, ensuring that U.S. embassies and consulates are safe and functional. They're in charge of security, communications, technology, and procurement. Keeping an embassy running is challenging even when you have easy access to everything you need, from food to computer repairmen; but, as you can imagine, it's a lot more challenging in places where you can't take electricity or water for granted. Administrative officers are often quite technologically savvy; but above all else, they must be creative problem-solvers and good negotiators.

The economic and political specializations are the most similar; and indeed, many embassies and consulates have a joint economic-political office. It's increasingly difficult to separate politics from economics. FSOs in these areas follow, analyze, and report on economic and political developments in their host countries. These positions entail little contact with the average citizen, but do involve considerable contact with leaders in business and government.

Finally, whereas economic and political officers relay information *to* Washington, public diplomacy officers relay information *from* Washington. They act as public relations officers for the United States, explaining and defending U.S. foreign policy to officials and journalists in their host countries. They also follow local media coverage of the U.S. These officers must be politically sensitive, media savvy, and verbally adroit and must also have excellent interpersonal skills.

Which specialization did you choose?

I requested the political track. That is what I get most excited about: the process of political change, the rise and fall of governments, human rights, relations between the state and the citizen. I'm currently in a joint political-economic section, which allows me to do a little bit of economic analysis—something else I enjoy.

In fact, my second posting was as an economic officer in Nairobi, Kenya, where I spent two years. I reported to Washington on the Kenyan economy and environment. Environmental and technology issues fall within the purview of economic officers. I enjoyed my tour in Kenya, a beautiful country. Unfortunately, that embassy was blown up two years after I left Nairobi. I knew a number of the people who were killed.

I guess safety is often an issue in the FS.

It is, in some situations more than others. But even though we face anti-American sentiment in some countries, in most cases, the people who feel that way are a small minority. Many more people are very supportive and go out of their way to demonstrate their hospitality.

After two international postings, did you return to the States for a while?

Yes, after four years abroad, I spent a year in Washington as a staff assistant in the European Bureau, where I prepared briefing papers and reports for government officials traveling abroad or being visited by foreign dignitaries. I then took a year's leave of absence to work on a book on U.S.-Tibetan relations.

I spent most of the following year studying at the State Department's Foreign Service Institute, preparing for my current posting here in the Czech Republic. For ten months, I studied Czech language and Central European history, politics, and economics. I arrived in Prague a few months ago and will be here for three years, following and analyzing Czech domestic politics and Czech relations with its neighbors.

Is that intensive training considered part of your job, or is it a sabbatical?

It's part of the job. It's an unusual job, to be sure—being paid to go to school. During their careers, FSOs take many extended study programs. There is an ongoing opportunity to learn, which is, I think, one of the most exciting things about the FS. You never get stale because you don't have a chance to. You never stay at a post for longer than three or four years. You are always changing countries and often continents. And you're also changing the focus of your work: one tour might focus on military issues, the next on human rights.

Do you have much choice in your postings?

You bid on jobs and rank them by preference; but in the end, you go where you are assigned. However, your experience and skills can make a difference. The fact that I had studied international relations may have helped me become a political officer. And the fact that I spoke German probably helped in my current assignment to the Czech Republic. However, the joke within the FS is that if you speak Spanish, they'll send you to Japan.

Postings can seem a little arbitrary at times, but the purpose is for us to gain a broad range of skills. We are generalists. We are not brought in as specialists in a particular region or country; we are expected to work successfully in a lot of countries over the world and in a lot of different types of jobs.

You've now worked in three specializations. What have you enjoyed about them?

In my consular work, I enjoyed being able to help people in practical ways, like helping Americans who ran out of money in Lahore get home, or checking on the well-being of American citizen children whose parents were not living together. Often, we could send the non-custodial parent a current picture of their child and an assurance that the child was okay and was going to school. Being able to make a difference in individual lives like that is very rewarding.

As an economic and now political officer, I am not as directly involved with American citizens, but it is a real pleasure to represent the U.S. government overseas and to enjoy the hospitality that is extended to us as representatives of the U.S. government. I get to meet leaders not only in the government but in the economic and cultural life of a country, and that's exciting.

It's also exciting to help advance the cause of international relations. When I was in Kenya, a speech I wrote for the U.S. ambassador made the front page of the leading English-language newspaper in Nairobi. The speech encouraged the Kenyan government to move ahead with cooperation with its East African neighbors, Tanzania and Uganda. A few months later, the Kenyan government did so. While my speech was certainly not the only factor, in my small way, I felt I was able to have a positive influence.

And what do you find difficult about the FS?

The FS is an emotionally demanding career. Since everyone within it moves every few years, you must constantly make new friends. You don't have the luxury of getting to know people over time. You are also separated from your relatives. Fortunately, my parents live in Washington, D.C., so I can spend time with them when I'm posted to Washington. But if you're from California or Minnesota, and if you stay in the FS, you'll never again live near your family; you'll only see them on holidays. The frequent moves keep you from getting stale, but you pay a price for them.

In your foreign postings, you meet many friendly people, but it's still easy to feel far from home. It can also be wearing to have to represent the U.S. in all you do—always to be careful in whom you meet, where you go, what you do.

Where is your career likely to go from here?

I'm now a political officer. Several years from now, I hope to be a political counselor, in charge of the political section of an embassy. The next big step up after that might be to become a deputy chief of mission or the head of a consulate. Depending on promotions, I can stay in the FS for at least 15 years. Whether I stay longer than that depends on whether I make it into the Senior Foreign Service, which only a fraction of FSOs do. Most FSOs do not become ambassadors. It's a bit like the military: there are a lot of second lieutenants, but not many generals.

Do you have any final words about the FS?

I love the FS. I wanted to be in it for years and years. I took the FS exam three times before I finally got in. It has, as I'd hoped, given me the chance to combine a love of travel with an interest in international relations and a desire for public service. It's a wonderful life—one that I hope some of your readers will consider, because we need bright, able people from all over America and from all different backgrounds who want to serve their country overseas.

The State Department has an extensive Web site about careers in the Foreign Service at www.state.gov/www/careers/

MARK YOUR CALENDAR...

with these December–February registration deadlines and event dates for selected academic competitions. Inquire about competition format, dates, and fees.

■ ***Fall***

National Spelling Bee—Local sponsors determine specific deadlines. Students enter only through a sponsoring newspaper; ask your local press if they participate, or contact the Spelling Bee to find your local sponsor: Scripps Howard National Spelling Bee, P.O. Box 371541, Pittsburgh, PA 15251-7541; (513) 977-3040; bee@scripps.com; www.spellingbee.com/

■ ***December 1***

Intel Science Talent Search—Individual students enter original projects, grade 12 only. Applications available now: Intel Science Talent Search c/o Science Service, Inc., 1719 N Street, NW, Washington, DC 20036; (202) 785-2255; sciedu@sciserv.org; www.sciserv.org

■ ***December/January***

JETS-TEAMS Competition—Schools register teams, grades 9–12; call for exact state deadlines: Junior Engineering Technical Society, 1420 King Street, Suite 405, Alexandria, VA 22314-2794; (703) 548-5387; jets@nae.edu; www.asee.org/jets

■ ***December 31/January 15***

American Mathematics Contests (AMC->10 & AMC->12, formerly AHSME)—First qualifying round for the USA Mathematical Olympiad; schools register, grades 9–12; lower fee for earlier date; exam date is Tuesday, February 15, 2000: Titu Andreescu, Director, American Mathematics Competitions, University of Nebraska-Lincoln, Lincoln, NE 68588-0658; (402) 472-6566; titu@amc.unl.edu; www.unl.edu/amc/

■ ***January 8***

MATHCOUNTS—Schools register 7th and 8th graders; participants compete in chapter meets; state contests in March: MATHCOUNTS Foundation, 1420 King Street, Alexandria, VA 22314; (703) 684-2828; mathcounts@nspe.org; www.mathcounts.org

■ ***January 10***

National Latin Exam—Latin teachers register students in Intro Latin–Latin 5; Exam given in March: ACL/NCJL, National Latin Exam, P.O. Box 95, Mount Vernon, VA 22121; (703) 360-4354; www.umich.edu/~acleague/visitors.html

■ ***January 12***

Duracell/NSTA Invention Challenge—Individuals or two-person teams work with sponsoring teachers and enter original devices powered by Duracell batteries; Grades 6–12: National Science Teachers Association, 1840 Wilson Boulevard, Arlington, VA 22201-3000; (703) 243-7100; duracell@nsta.org; www.nsta.org/programs/duracell/

■ ***January 15***

National Mythology Exam—Schools register students in grades 5–9: American Classical League, Miami University, Oxford, OH 45056; (513) 529-7741; americanclassicalleague@muohio.edu; www.umich.edu/~acleague/visitors.html

■ ***Early February***

U.S. National Chemistry Olympiad—Teachers nominate students who have taken high school chemistry, call for local test dates: American Chemical Society, Education Division, 1155 16th Street NW, Washington, DC 20036; (202) 872-4600; www.acs.org/education/studprog/olympiad.html

PLANNING AHEAD FOR COLLEGE

by Linda E. Brody, Ed.D.

Academic preparation is the first and most fundamental aspect of getting ready for college. Begin planning your academic schedule in middle school and continue throughout high school so that you will acquire the background and credentials required by the college of your choice.

Also set aside time to contemplate your own needs and to investigate college offerings. If you wait too long, you may find yourself as a high school senior, confused about what you want in a college, with no idea of where to apply, and without the course preparation you'll need to succeed.

We offer this calendar as a guide to help you plan ahead.

A Calendar for College Planning and Preparation – Part II: Grades 10–12

Part I, for grades 7–9, appeared in the last issue of Imagine.

Grade 10

You have the luxury this year of exploring colleges without pressure. Take advantage of it.

- Take the PSAT in the fall for practice.
- Get more involved in extracurricular activities that you enjoy.
- Spend time in the guidance office or career center reading college catalogues and investigating other resources.
- Attend a college fair where college representatives display information and talk to prospective applicants.
- Visit college campuses whenever possible. Keep notes on campus attributes that seem positive or negative to you.
- Seek opportunities for career exploration through part-time jobs, volunteer activities, internships, and mentorships.
- Take SAT II Achievement tests and AP exams relevant to your courses this year.
- Reevaluate your curriculum plan with a guidance counselor. If you are running out of challenging coursework, consider part-time college courses during grades 11 and 12.
- Read books, magazines, and newspapers in your free time.
- Plan an interesting, challenging summer. Consider enrolling in a summer course to acquire the background to take more advanced courses during grades 11 and 12.

Grade 11

This is probably your most important year for establishing a strong academic record and proving your commitment to extracurricular efforts.

- Evaluate your courses, study habits, and extracurricular activities to maximize your performance in all areas.
- Take the PSAT in the fall; scores will be used for the National Merit Scholarship Qualifying Test.
- Think seriously about what you want in a college: big or small campus, urban or rural setting, highly competitive or less so, etc. Contemplate your long-term goals.
- Discuss college plans with your parents and guidance counselor.
- Spend time in your school's guidance office or career center reading college catalogues. Use a computerized college search if available. Learn about financial aid options. Develop a list of colleges that appear to meet your needs.
- Meet with college admissions representatives who visit your school; attend a college fair.
- Talk with graduates of your high school about their college experiences.
- Visit as many colleges on your list as possible, preferably during the school year. Call ahead to arrange an admissions interview, tour, and overnight dorm stay.
- Focus on the extracurricular activities you enjoy most. Work to assume a leadership role this year or next.
- Practice for the SATs with old tests, available from The College Board or in bookstores.
- Take the SAT I—and the ACT, if it's required by any colleges on your list.

Grade 11 (continued)

- Take the SAT II exams required by colleges on your list, especially if you are considering Early Decision. (If you will apply for regular admission, you may take some in the fall or winter of grade 12.)
- Take AP exams for any AP courses you took this year.
- Continue to read books, magazines, and newspapers in your free time.
- Reevaluate your curriculum plan. If appropriate, make arrangements for college courses or other supplemental learning opportunities during grade 12.
- Consider working with a mentor this summer or next year.
- Plan a great summer. Increase your learning beyond high school offerings or develop an area of interest more fully. If appropriate, ask a mentor, teacher, or other adult for a college recommendation based on your summer experiences.
- Over the summer, write to colleges for admissions and financial aid applications.

Grade 12

The pace and intensity of the college process increase significantly this year.

- Continue to work hard to excel in school. Don't succumb to senior slump; colleges may rescind an offer of admission if your grades drop dramatically.
- Show commitment to extracurricular interests through leadership and/or high achievement.
- Retake SAT I if you believe your score will improve. Take remaining SAT II tests.
- Visit additional colleges, if necessary.
- Sign up for college interviews. Send thank-you notes afterwards.
- Meet with college admissions representatives who visit your school.
- Discuss your college preferences with your counselor. Be sure your final list includes at least one college where you are sure to be accepted and where you will be happy.
- Ask for letters of recommendation from your teachers and guidance counselor.
- Mark your calendar with admission deadlines. Prepare all application materials carefully. File your application and all supplementary materials—recommendations, transcripts, standardized test scores, financial aid information—on time.
- Check with college admissions offices to verify that they have received all your application materials.
- Take AP exams for this year's AP courses.
- If you're still undecided about which college to choose when acceptances arrive, plan a visit and stay in the dorm.
- Send thank-you notes to your guidance counselor, teachers, and anyone else who helped you in the admissions process.
- Continue to read books, magazines, and newspapers in your free time. This knowledge base will help you in college—and in life.

Exploring Space in Cyberspace

You're just a click away from the Akna Mountains of Venus and the south pole of Jupiter's moon Europa. Here are some of the best ways we've found to travel to the planets:

The Nine Planets: A Multimedia Tour of the Solar System
seds.lpl.arizona.edu/nineplanets/nineplanets

Take the graphically uninteresting table of contents to some great pages, full of hyperlinked text and amazing pictures, about the planets and everything related to them.

Planet Tour
cass.jsc.nasa.gov/research/stereo_atlas/HTDOCS/PLANETS.HTM

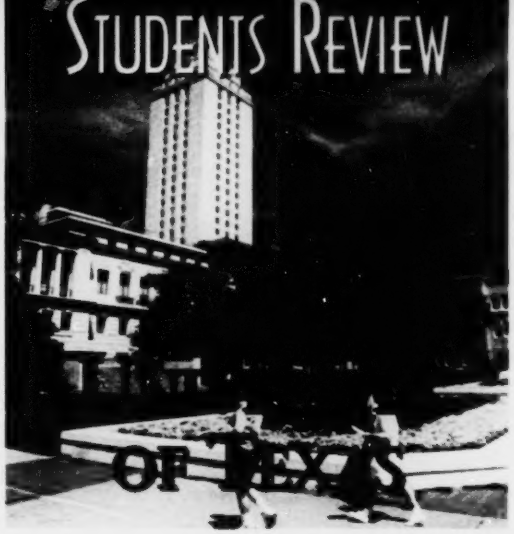
This site is actually a preview of images available on a CD for sale by the Lunar and Planetary Institute, but if you've got 3-D glasses, you can still enjoy the close-up images of planetary surfaces. Most of the text is fairly technical.

Views of the Solar System
www.solarviews.com/eng/

Want to fly by Jupiter's moon Io or see how Neptune rotates? Visit this site that features animations of various planetary motions as well as lots of history, scientific information, and photographs.

Welcome to the Planets
pds.jpl.nasa.gov/planets

A collection of images and information from a CD put together by NASA, the Planetary Data System, and the Data Distribution Laboratory, this site features great photos and descriptions of not only the planets, their moons, and their rings, but also the spacecraft that have explored them.



The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.

Our reviewers include 17 honors students, who major(ed) in aerospace engineering (1), art history (1), chemical engineering (1), computer science (1), English (2), government (2), history (3), Latin American studies (1), physics (1), Plan II (17), psychology (1), and Spanish (1). (The number of majors exceeds 17 because most students have double majors.) Students' comments appear within quotation marks.

Quality of Academic Instruction for Undergraduates

Like most state universities, the University of Texas at Austin (UT) has numerous honors programs for its top students. In this review, we focus on one of them: an interdisciplinary studies program, called Plan II (P2), for 150 students per year. P2 differs from most honors programs in that its core curriculum is itself a major. Its students take classes both within the program and in the university at large: during the first two years, they take small seminar courses taught just for them, while during their last two years, they pull away from the P2 core and take courses in a second major or concentration. All reviewers were students in this unusual honors program.

"The P2 Honors Program is one of the oldest and most respected liberal arts honors programs in the country. With courses in logic, physics, and math as well as philosophy, literature, and history, the P2 core is incredibly well-rounded and encourages a love of learning, rather than narrow preparation for a particular field."

"P2 is one of the rare programs that actually lives up to the propaganda. The best professors at UT actually *apply* to teach P2 courses on their favorite subjects, ranging from social systems theory to medical ethics to Mark Twain. Most P2 students also complete another major, and UT has a wide variety of excellent departments to choose from—engineering, psychology, biology, English, government. In non-P2 courses, you pretty much get out of them what you put into them. If you don't want to learn anything, no one will make you; but the professors are talented and you can get a great education if you are interested."

"In P2, I receive much of what I would expect at a small, private institution nestled comfortably within the bustling metropolis that is UT. The unique arrangement of special, P2-exclusive courses means that we have access to some of the best professors and resources at this world-class university. Perhaps most importantly, P2 placed me immediately in a 'niche' that can be so hard to find at a large university."

"Entering P2, you get a real sense that you've joined a community of intellectuals—faculty and fellow students—who are genuinely interested in hearing what you think. This atmosphere is greatly enhanced by some incredible support staff. Advising in P2 is wonderful, and as a result, P2 students end up getting much more out of their classes in the university at large than do most non-P2ers. I don't know of any other department on campus where undergraduates drop by just to hang out. Perhaps the best symbol of P2's welcoming, comfortable atmosphere is its famous cookie jar, which is never empty."

"Instruction in P2 may not be quite as rigorous as that in the Ivies, but quality is definitely excellent. In fact, the more relaxed atmosphere allows student to pursue their individual interests more fully, facilitated by the high degree of instructor accessibility. Furthermore, P2 is a place where the ideas you are taught are not necessarily those that are 'in fashion.' We are not being trained as the shock troops of the intellectual elite. At a public university, issues facing the world at large are pushed in our faces every day, and real-life concerns find their way into the classroom discourse."

Social Life

All UT students, not just those in P2, enjoy the pleasures of life in Austin, which all reviewers agree is a great place to be an undergraduate.

"Austin is, without a doubt, one of the best college towns in the nation. Live music abounds in coffee shops, bars, clubs, and sometimes even the streets. The city has tons of great restaurants, dance clubs, and parks; and its location in the heart of the Texas hill-country lends itself to great outdoor activities. Austin itself has several lakes that invite various water sports and waterside strolls. The city houses most of the university's 50,000 students, and this gives it a very young and energetic feel. Austin is also the state capital, so all kinds of governmental and nonprofit organizations are headquartered here."

"Austin has a charm that'll suck you in and leave you trapped in paradise. And if you like road trips, there are tons of cool small towns nearby where you can dance and eat some of the best BBQ on the face of the planet."

"UT's student population is incredibly diverse. There are over 700 student organizations, ranging from College Republicans to the Sailing Club to the Asian Culinary Club. On-campus housing is good, though limited; 70% of it is reserved for freshmen. The Honors dorm is available to a limited number of P2 students and is a fantastic living experience. For students who don't get on-campus housing, there are private dormitories and plentiful apartments. The location and social climate of UT and Austin played a major role in attracting me to the school."

"If you can score Honors Hall housing, you're set. It houses freshmen in all of UT's honors programs, not just P2. Many P2s live there, and a definite community forms naturally. The dorm is buzzing with activity—intellectual and otherwise. It is a hub for organizing trips and BBQs and buying group football tickets. If you live elsewhere, it can be harder to connect."

"P2 students, faculty, and staff form a tightly knit community. Most students meet their best friends in P2. Parties at professors' houses are common, and many students stay in touch with their instructors well past graduation. There are plenty of opportunities to participate in social activities with other P2 students, but they are all completely voluntary. The P2 Students' Association organizes parties, dances, picnics, and so on and supports numerous organizations, including *The Undecided* (the daily newspaper), a theater group, and societies for P2s who are double majoring in engineering or premed."

What Do You Like Best about UT/P2?

"I loved that P2 provided me a small sort of family in such a large university setting. I might have been intimidated by UT if I hadn't had the P2 office to go to whenever I wanted to ask questions or get help. I loved that my fellow students were just as inquisitive and interested as I was. I really enjoyed being taught by the cream of the crop of the UT faculty. And I loved living in Austin. It's a great college town. The music scene is the best."

"Though academics rate high, the more intangible atmosphere of Austin and the campus are equally important. The place has a very independent air about it, a great diversity of ideas within and without the university, amazing live music all the time, and no lack of optimism and sunshine."

"The fact that I was able to take some time to decide what my academic specialty would be, yet I never get behind on my degree plan. And that I got to take a lot of unrelated but interesting courses and still end up gainfully employed."

What Do You Like Least about UT/P2?

"Not being able to play a varsity sport. At such a large school, the sports program recruits top athletes, which I am not. But I contented myself with intramural sports and pick-up games."

"Even though P2 is very small, it is impossible to forget that you are at the largest university in the country."

"It's very easy in P2 to become a 'jack of all trades and master of none.' The P2 program never pushes you to specialize, which can leave you feeling directionless. If you don't start out with a strong focus, you can spend your first two years taking a lot of wonderful intro courses in a wide variety of departments. This is great, but at some point most students feel pressure (from within or without) to focus, and may feel ill-prepared to do so. On the other hand, this can also be the most exciting, special part of P2—the chance to follow your own passions, to do what you want, not because it fits into a pre-defined major or career path, but because it is what makes you truly happy."

UNIVERSITY OF TEXAS

Austin, TX 78712
(512) 475-7440

- 4-year state university
- Urban campus in the Texas state capitol
- Full-time undergraduate enrollment 1999-2000: ~19,000 men; ~19,000 women.
- Special features: For more about P2 or any of UT's many other honors programs, see www.utexas.edu/student/uhc/honprog/

Who Would Be Most Compatible with the Academic and Social Atmosphere at UT/P2?

"Someone who gets excited about both English and physics, who wants to know *everything*—and can handle responsibility. The P2 advisors are great, but they won't tell you what to do; they'll only give you options. People who are actively engaged in their educations do best."

"P2 is predominantly a liberal arts program with science elements included to round it out. It attracts two crowds of students: the 'undecided' contingent, who take advantage of its curricular flexibility to find a subject they enjoy while being subjected to minimal pressure to choose, and the dual majors in science or engineering, who want to quench their desire for right-brain activity while pursuing a science major."

If You Had It to Do over Again, Would You Go to UT/P2?

All reviewers said yes, most with great enthusiasm.

"Absolutely. P2 and UT combined to give me a wonderful college experience, full of flexibility, dynamism, and vitality. One offered the intimacy and collegiality of a small school. The other laid at my disposal the facilities of a world-class research university. In short, I feel like I had the best of both worlds."

"Heck yes. P2 stands as one of my all-time best decisions. My senior year of high school, I won Best Student award in both Physics II and Art II. P2 encouraged me to resist being reduced to following only one path and allowed me to follow many. Some might worry that this leads to difficulties upon graduation. It does not. Apart from the majority who go on to law or medical school, P2 graduates are often sought after by companies who realize the talent they hold. I was hired by the first company I interviewed with."

"Definitely. When I first chose UT, I felt sort of disappointed: my friends were going off to great private schools, and I was going to be one among 50,000. Now I wouldn't trade places with them for money. To me, the private school atmosphere is a sort of limbo, waiting for real life to begin. Not only have I saved a fortune by choosing P2, but I live in the real world."

"Definitely. UT is so flexible and laid-back, and P2 is great. I came to UT on a merit scholarship, having wanted to go to an East Coast school. Now I'm so glad that I'm not in that fast-paced world. UT isn't *slow*-paced; it's what you make it. And winter weather is great. No snow!"

As you try to find the college or university best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAAY.

Creative Minds Imagine

Moving Through Still Water

by Claire Whitenack

The lake opens up
its smoothness
into a furrow
we spread behind us.
There are no clouds
tonight; the stars
break the water
like fish-eyes.
We drift as strangers here.
the ghosts of reeds
have suspended us
in this flat joining
of black sky
and its reflections.
The motions of the new moon
have disappeared
into the mouths of roots
that gather on the edge
of both worlds.
There is no familiar silver
there is no end to the circle
of blackness
though willow and cattail
rest in the night's throat
we drift as strangers here.

A ninth grader at Albemarle High School in Charlottesville, VA, ***Claire Whitenack*** *enjoys band, chess, and cross country running.*

The Longing

by Michael Bleicher

after ***Fisherman's Cottage on the Cliffs at Varengeville***
by Claude Monet

I watched the white of the sails
Against the shimmering blue of the water
And wondered
What it would be like to be out *there*
Instead of in *here*.
But I knew I couldn't.
"Not until you're older," they would always say.
Oh, to be out on that glorious blue
For five minutes,
And come out dripping wet,
Freezing, and waterlogged ...
But to be in there, just in there.
The white seemed more white
On those sunny May days.
The blue more blue.
The sun more yellow.
And my longing much greater.

Michael Bleicher*, a fifth grader from northern California, loves literature, music, drama, and art. Michael also enjoys cartooning and has published his cartoons in his school newspaper.*

THE COACH'S CORNER

Choosing a Topic for National History Day

by Mark Robinson

Mark Robinson knows National History Day (NHD) inside and out. Mr. Robinson participated in NHD for five years; in 1991 his documentary project entitled "Angie Debo: Defender of Forgotten Rights" won the senior documentary competition. He has also coached several winning projects from Iowa and has seen hundreds of winning entries as a judge and state coordinator. Mr. Robinson now works for NHD as the Development and Public Relations Coordinator.

National History Day is an exciting competition for which students conduct extensive research on the year's theme and present their findings in papers, exhibits, performances, or media presentations. At the five-day national event, state winners in both the junior division (grades 6–8) and the senior division (grades 9–12) vie for prizes of $500–$5,000, and the top senior contestant wins a $75,000 scholarship. For more information about NHD, visit their Web site at www.nationalhistoryday.org

Probably the most important step in producing a History Day project is choosing your topic. A good topic is absolutely essential if you are going to create a successful project and enjoy yourself in the process. Many people find it hard to think of topics. Don't despair! Just follow this simple formula to find the perfect topic for you: Theme + Expectations + Appeal + Sources = Great Topic

> “Theme + Expectations + Appeal + Sources = Great Topic”

THEME: This year's theme is Turning Points in History. Start by reading the theme narrative on the NHD Web site and checking the list of suggested topics. That will help you think about suitable types of topics. Then, think about how you might adapt one of those topics to suit your interests. If none of the topics seems interesting to you, remember that you can choose another topic.

EXPECTATIONS: If you are doing the NHD project as a classroom assignment, make sure that you understand what your teacher expects. If your class is studying medieval European history, your teacher might not be too pleased if you research an event of the 1960s! Or maybe she or he won't care—but you should definitely check first.

APPEAL: Pick a topic that appeals to you. Otherwise, your heart won't be in it, and doing this project will be a burden, not a wonderful adventure. Think about activities you enjoy and events or subjects that have piqued your curiosity. Can you adapt any of the suggested topics to suit these interests? Here are some ideas to help you get going:

> ***Talents, Interests, and Activities:*** Could you relate any of your talents, hobbies, or interests to the theme? For example, if you write for the school newspaper, why not examine the John Peter Zenger case in New York in the 1730s, which established truth as a defense for libel? If you think you might want to become a teacher, you might study Horace Mann's educational reforms in the 1830s and 1840s, which set the tone for American public education for years to come. Someone interested in the sciences might choose one of many scientific turning points, such as Mendel's work on genetics, as a focus.

History Courses: Don't overlook what you've learned in class! Did any historical figures intrigue you? Perhaps you sympathized with a reformer such as Jane Addams, who tried to improve the lives of immigrants, or a labor organizer such as Cesar Chavez, who organized farm workers. Or maybe a scientist such as Galileo or a leader such as Shaka Zulu earned your admiration.

Popular Culture: Have you read any historical books (including novels) or seen anything historical on television or at the theater that captured your imagination? If you loved the *Little House on the Prairie* books, you could do a project on the westward migration. If you thought Mel Gibson was cool in *Braveheart*, you could study Scotland's struggles with England.

Ancestry: Is there some way you can relate the theme to the history of your family? Whether your family was in the U.S. or in another part of the world, major events of the past century, such as the Great Depression or one of the world wars, may have affected your grandparents or great-grandparents. Ask older family members if they can think of ways your family's history might relate to the theme—and ask if they have or know of any family records that might help in your research!

State and Local History: Look around your neighborhood, city, region, and state. What historic sites have been preserved? Is there a local historical society or museum that has exhibits on area history? Did a national or international event affect your locality? For example, could you use your community as a case study of the effects of the end of slavery or of a particular war?

Talk with people if you're still at a loss for ideas. Brainstorm topics with your friends or family. This can be a great way to get you thinking about a topic when you're having trouble coming up with anything on your own. They might know about some events or people you haven't heard of, or they may be able to suggest a different angle or approach.

SOURCES: Having a topic that appeals to you won't do any good if you can't find enough primary and secondary sources. Primary sources provide firsthand accounts about a person or event. They include letters, diaries, speeches, interviews, newspaper articles from the time, and many other types of documents. Secondary sources are usually published books or articles in which the author presents a personal interpretation of a topic, based on primary sources. Most library books are secondary sources, as are encyclopedias. Before committing to a topic, you need to do a little research just a brief check to make sure your topic will work. See what's available at your school or public library, and also check the National History Day Web site, which has links to the major libraries, historical societies, and museums in each state (from the NHD home page, click on "Related links & resources").

So there you have it: Know what the theme is, understand your teacher's expectations, consider what appeals to you, make sure there are enough sources, and you have found the perfect National History Day topic for you!

- links to all sites mentioned in this issue
- links to colleges we've reviewed
- resources for academically talented students
- and a page where you can tell us what you think of the new *Imagine*

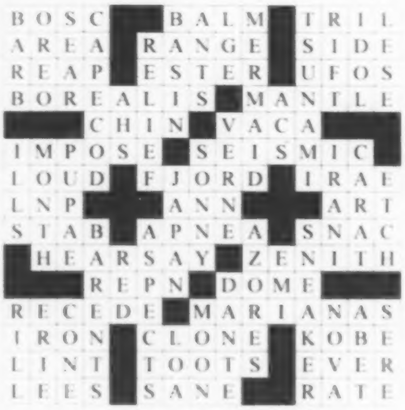
Coming soon: Imagine readers' listserv!

Back issues available on a range of topics:

- Literature, Language, and Linguistics
- Mathematical Pursuits
- Public Service and Politics
- Multimedia Communications
- Environmental Science
- Performing Arts
- Cross-Cultural Studies
- Career Discovery

Order online at www.jhu.edu/gifted/imagine or call (215) 826-0707.

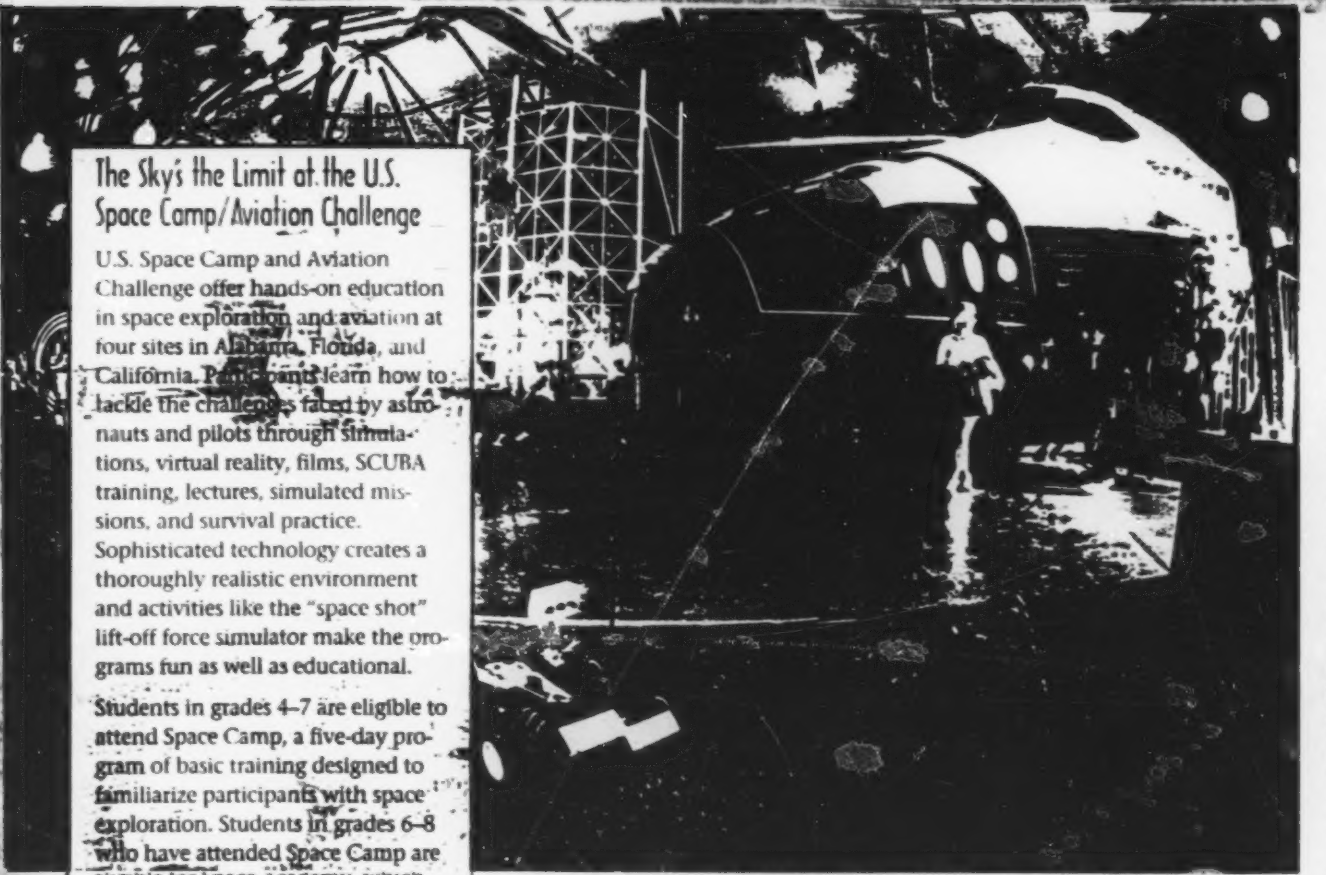
Solution to Word Wise



B	O	S	C	■	■	B	A	L	M	■	T	R	I	L
A	R	E	A	■	R	A	N	G	E	■	S	I	D	E
R	E	A	P	■	E	S	T	E	R	■	U	F	O	S
B	O	R	E	A	L	I	S	■	M	A	N	T	L	E
■	■	■	C	H	I	N	■	V	A	C	A	■	■	■
I	M	P	O	S	E	■	S	E	I	S	M	I	C	■
L	O	U	D	■	F	J	O	R	D	■	I	R	A	E
L	N	P	■	■	■	A	N	N	■	■	■	A	R	T
S	T	A	B	■	A	P	N	E	A	■	S	N	A	C
■	H	E	A	R	S	A	Y	■	Z	E	N	I	T	H
■	■	■	R	E	P	N	■	D	O	M	E	■	■	■
R	E	C	E	D	E	■	M	A	R	I	A	N	A	S
I	R	O	N	■	C	L	O	N	E	■	K	O	B	E
L	I	N	T	■	T	O	O	T	S	■	E	V	E	R
L	E	E	S	■	S	A	N	E	■	■	R	A	T	E

More about... Cape Cod and Dante.

What *is* a terminal moraine? It's a pile of rocks and dirt that was bulldozed by the advancing front of a glacier. Cape Cod is a terminal moraine left by the great Pleistocene Ice Age glaciers of 20,000 years ago. And (re 49 Down) when Carnegie Mellon roboticists designed a robot to descend into the sulfurous mouth of a volcano, they named it "Dante."



U.S. Space Camp Mountain View, California Training Center

Space Camp—from page 19

The mission ended before we were able to get communications back, and we left the shuttle excited, but frustrated.

During the EDM, everything is so intense that it's easy to forget you're doing a simulation. After the mission, I heard that the people in mission control were so frustrated that they actually screamed at each other as they scrambled to respond to our many needs. On the shuttle, we had moments of rest when we could chat with each other, but the whole environment was so realistic, the problems and normal procedures so demanding, that the mission felt very real and gave me an unbelievable sense of accomplishment.

I could say much more about Space Camp. From late-night chats in the "habitat" (our dormitory) to a ride on the ever-popular "space-shot" simulator, there's never a dull moment. I had a blast and learned much more than I had expected. Now, when I listen to shuttle launches or read NASA articles, I understand all of the terminology and have a clear idea of what's going on. I learned how to look beyond obvious solutions when facing unexpected problems. I learned about medicine and physics. But most of all, I gained a stronger interest in and appreciation for our space program. Who knows? Perhaps some day I'll go to Mars with Abby, or talk to her via mission control.

The Sky's the Limit at the U.S. Space Camp/Aviation Challenge

U.S. Space Camp and Aviation Challenge offer hands-on education in space exploration and aviation at four sites in Alabama, Florida, and California. Participants learn how to tackle the challenges faced by astronauts and pilots through simulations, virtual reality, films, SCUBA training, lectures, simulated missions, and survival practice. Sophisticated technology creates a thoroughly realistic environment and activities like the "space shot" lift-off force simulator make the programs fun as well as educational.

Students in grades 4–7 are eligible to attend Space Camp, a five-day program of basic training designed to familiarize participants with space exploration. Students in grades 6–8 who have attended Space Camp are eligible for Space Academy, which emphasizes shuttle crew activities, mission control, Space Station simulations, and working in micro-gravity environments. Students in grades 9–12 are eligible for Advanced Space Academy, the most intense educational experience for budding astronauts. Parent/child and adult programs are also available.

Aviation Challenge offers aspiring pilots five-day and weekend programs in simulated high-performance jet missions, water and land survival, and principles of flight. Students in grades 4–12 are eligible for one of three levels of difficulty—Mach I, Mach II, and Mach III—depending on their age and experience. Parent/child and adult programs are also available.

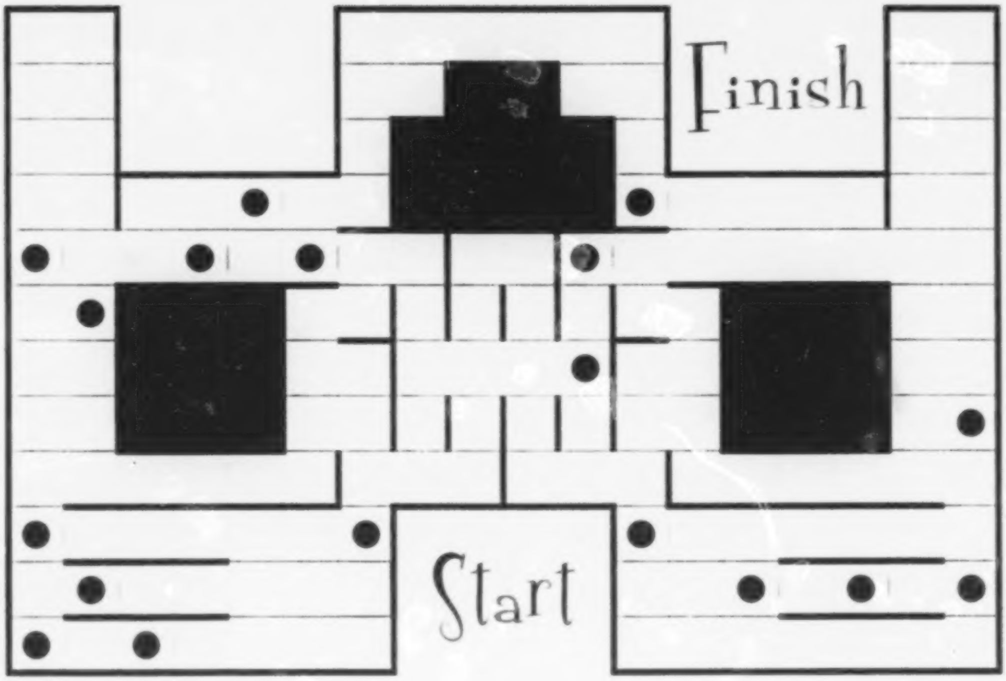
Discounts on most programs are available to groups of 12 or more.

For more information, contact the U.S. Space & Rocket Center, One Tranquility Base, Huntsville, AL 35805; (800) 63 SPACE, (256) 837-3400; www.spacecamp.com

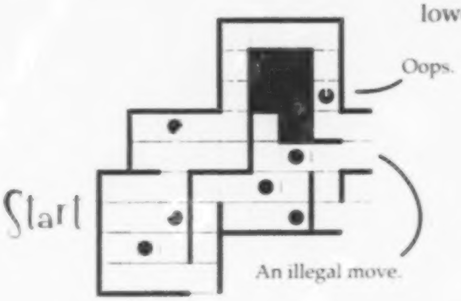
BEST COPY AVAILABLE

KNOSSOS GAMES

By Tim Boester

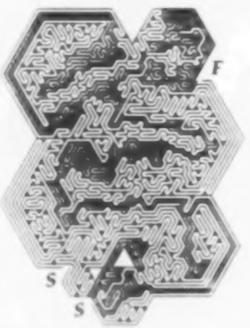


In the puzzle at left, jump like a chess knight from square to square in the blue grid that has been divided into rooms and corridors. You cannot pass through any of the walls, and you can pass over, but not land on, any of the squares with holes (the black dots). Also, you must move in an "L" shape, and not the "S" shape, as shown in the example at the lower left.



A graduate student in educational psychology at the University of Wisconsin, ***Tim Boester*** *now has additional puzzles on his home page: www.math.wisc.edu/~boester*

Solution to Knossos Game in our September/October issue

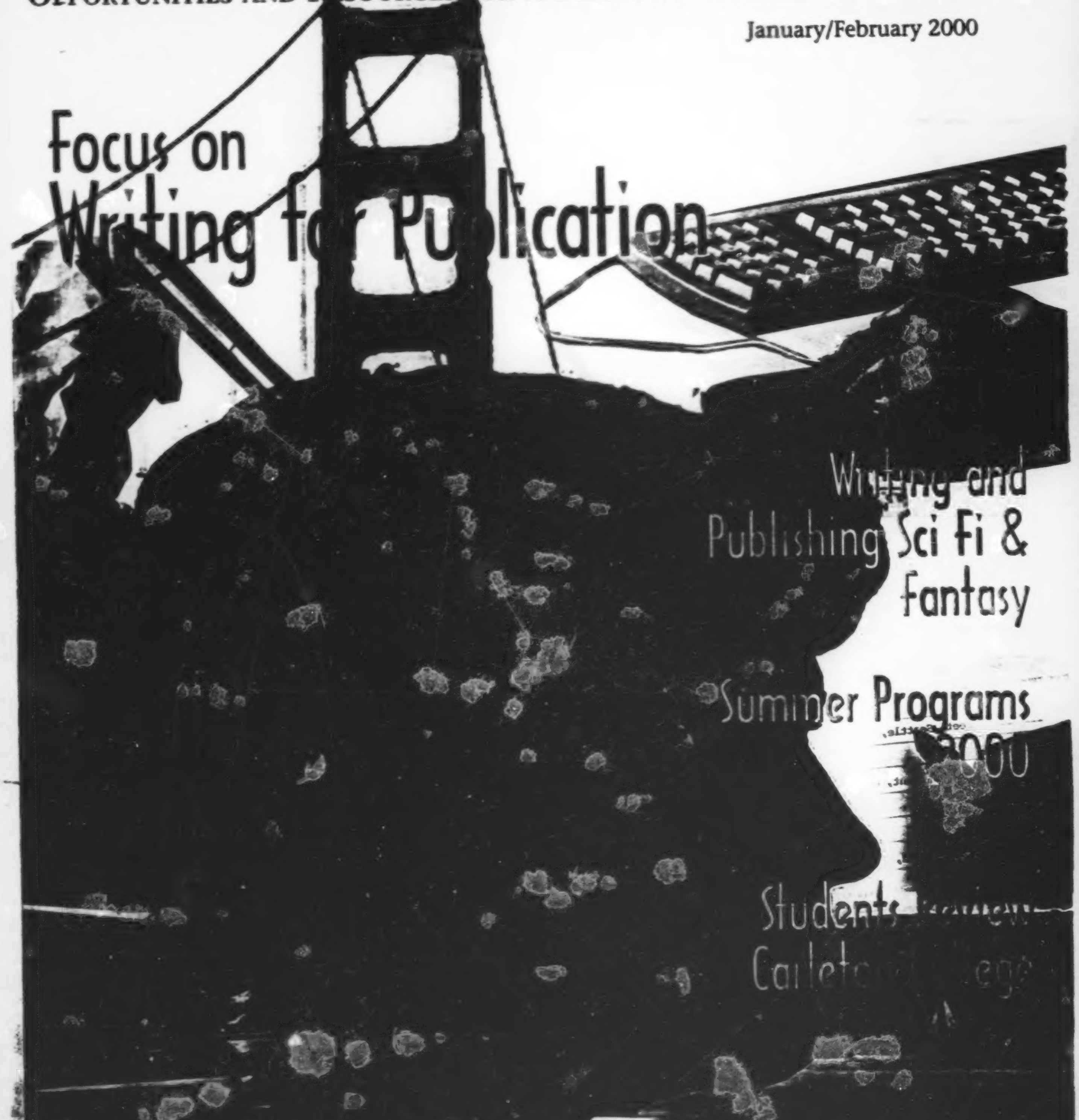


Published by the Johns Hopkins University Center for Talented Youth

ImaGiNe...

OPPORTUNITIES AND RESOURCES FOR ACADEMICALLY TALENTED YOUTH

January/February 2000



Focus on Writing for Publication

Writing and Publishing Sci Fi & Fantasy

Summer Programs 2000

Students Review Carleton College

TABLE of CONTENTS

Features

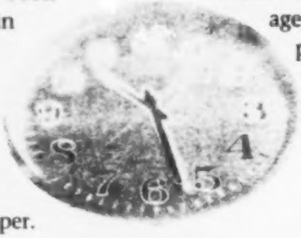
4 **On Becoming a Writer**
17-year-old published writer Heather Jones shares some strategies for novice writers.

6 **Making Contact: Cover Letters & Query Letters**
Want to publish in a magazine? Start by writing to the editor.

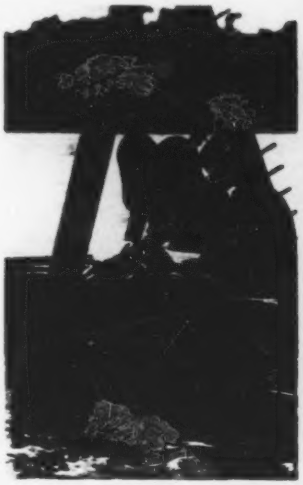
8 **To Observe, To Think, To Question ... To Write**
Why do you write? That's the question we asked Nick Sheff, winner of the 1999 Ernest Hemingway Writing Award for commentary writing.

10 **Penning the Impossible: Writing and Publishing Science Fiction and Fantasy**
You love reading sci fi and have thought of publishing a story yourself. Sci fi writer Yoon Ha Lee offers some tips for succeeding in this popular genre.

12 **A Summer at Detroit Free Press**
Simone Sebastian thought she had learned all she needed to know about journalism in high school ... until she interned at a daily professional newspaper.



14 **Resources for Writers**
Where to publish, writing contests, Web sites for young writers, and more.



20 **Academic Summer Programs 2000**
Our annual listing of some of the best summer programs for talented students.

23 **Why We Keep Going to Academic Summer Programs**
What's a student to do after she's passed the age limit of talent search summer programs? Amy and Katie Burghardt discuss options for older students.

Departments

18 **Planning Ahead for College**
Preparing for college in residential summer programs

25 **Mark Your Calendar**

26 **Off the Shelf**
Review of *Verse & Universe: Poems about Science and Mathematics*

27 **Word Wise**

28 **Exploring Career Options**
Interview with bioinformaticist Vivien Bonazzi

31 **The Coach's Corner**

32 **Students Review Carleton College**

35 **Creative Minds Imagine**
Artwork by students at North Carolina School of the Arts

36 **Knossos Games**

ImaGiNe...

*Opportunities and Resources for Ac[illegible] Talented Youth**

ISSN 1071-605X
Volume 7 • Number 3
January/February 2000

Copyright © 2000 by The Johns Hopkins University.

*A trademark of The Johns Hopkins University.

All rights reserved. No portion of this journal may be reproduced by any process or technique without the formal consent of the Johns Hopkins University Center for Talented Youth.

Published five times a year—September/October, November/December, January/February, March/April, and May/June.

Periodicals Postage paid at Baltimore, MD, and additional mailing offices.

POSTMASTER: Send address changes to Imagine, P.O. Box 3073, Langhorne, PA 19047.

Imagine is published by the Study of Exceptional Talent (SET) at the Johns Hopkins Center for Talented Youth. This publication is an outgrowth of newsletters and programs that, for twenty-five years, have served highly talented students identified by the Study of Mathematically Precocious Youth and by SET.

Editor • Melissa E. Hartman
Assistant Editor • Diane Clavier
SET Director • Linda E. Brody, Ed.D.
Research Associate • Carol C. Blackburn, Ph.D.
Editorial Assistant • Mary Parker
Editorial Assistant • Rachelle Lipschultz
Designer • Delta Graphics & Communications

Annual subscription: $25.00
Institutions: $30.00

Address subscription inquiries to:
Imagine
P.O. Box 3073
Langhorne, PA 19047
(215) 826-0707 • fax: (215) 788-6887

Address editorial correspondence to:
Melissa E. Hartman
SET/CTY
The Johns Hopkins University
Baltimore, Maryland 21218
(410) 516-0309 • fax: (410) 516-0108
email: mhartman@jhu.edu

Web site: www.jhu.edu/gifted/imagine

STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION, 10/8/99

Title: Imagine. Pub. No. 1071-605X. Frequency: Sept./Oct., Nov./Dec., Jan./Feb., Mar./Apr., May/June. Five issues published annually. Subscription price: $25.00. Location of office of publication: SET/CTY, 2701 North Charles Street, Baltimore, MD 21218. Headquarters of publishers: SET/CTY, The Johns Hopkins University, 3400 North Charles Street, Baltimore, MD 21218. Editor: Melissa E. Hartman, SET/CTY, The Johns Hopkins University, Baltimore, MD 21218. Owner: The Johns Hopkins University, Baltimore, MD 21218. The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes have not changed during the preceding 12 months.

Extent and nature of circulation	Avg. no. copies each issue preceding 12 mos.	Actual no. copies single issue pub. nearest to filing date
A. Total no. copies printed	8213	8089
B. Paid circulation, mail subscriptions	4605	4923
C. Total paid circulation	6660	6978
F. Free distribution	9	9
G. Total distribution	6669	6987
H. Copies not distributed	1544	1102
I. Total	8213	8089

I certify that the statements made by me above are correct and complete. Melissa E. Hartman, Editor.

Writing (Not Just) for Publication

A research paper for your history class, an essay for your college applications, a cover letter to accompany your resume: all require excellent writing skills. Throughout your school, college, and career years, you'll face a variety of situations in which the quality of your writing will make a difference. Will you make the grade? Get accepted? Get the job? Earn a promotion?

In this issue of *Imagine*, we focus on Writing for Publication. But even if you're not interested in seeing your words in print, you'll find useful strategies and resources that can help you improve your writing. After all, publication is only the final step in a process that begins with a blank page or screen. Whether the goal is a high grade or a byline, the first steps are the same: generate ideas, write, and rewrite.

This issue's writers — teens who have had their work published in local newspapers and national magazines — offer insights that can help any writer. These young writers also reveal that writing isn't just work. It can be fun to create fictional worlds. It can be therapeutic to write about what bothers you. It can be satisfying to write about things that you believe in. And if writing becomes more than work, more than a task — if you can enjoy that process of communicating your thoughts with carefully chosen words — you'll become a better writer, published or not.

Help Imagine Grow!

In seven years, *Imagine* has grown from a 12-page newsletter into the 36-page magazine you now hold in your hands. To continue growing and offering you more information about how to get the most out of high school and prepare for college, we need to tell more people about *Imagine*. You can help.

Tell your school librarian, teachers, and counselors about *Imagine*. Mention it to your friends. Show them an issue or refer them to our Web site. With more subscribers like you, *Imagine* can become an even better magazine than it is today.

ImaGiNe...
ImaGiNe...
Opportunities and Resources for Academically Talented Youth
Focus on Writing for Publication
Sci fi & Fantasy
Programs

Visit our Web site at www.jhu.edu/gifted/imagine

Coming soon: Imagine readers' listserv!

On Becoming a

by Heather M. Jones

Heather Jones has participated in several fiction and poetry writing workshops as well as three UCLA online writing courses. Her poetry has appeared in ***Acorn, Offerings,*** *and* ***Night Roses****, and she has published editorials on* ***PBS Online*** *and in the* ***Plano Star Courier, Park Cities People****, and* ***The Dallas Morning News****. Here, Heather shares some strategies she's used to improve her writing.*

Read.

Read as much as you can. You wouldn't expect to master Beethoven's Ninth Symphony on the violin if you'd never heard a violin being played. Similarly, you must read a great deal to learn what is good writing, and what is bad.

Read Homer, Vergil, Aristophanes, and Beowulf, for starters. Read Greek mythology. These works consider the universal struggles of justice and revenge, pride, loyalty, war and peace, home and family. Many centuries after they were written, they continue to speak to readers of all backgrounds, continue to challenge them and change their lives.

If you want to write in a certain genre—sci-fi, fantasy, horror, mystery, romance, et cetera—read all the books you can in that area. Read Asimov, Verne, C.S. Lewis, Tolkien, Stoker, Shelley, Doyle, Christie, and other greats. Also read more recent works. You can learn not only what different publishers publish a lot of, but also what's been over-published.

Read the greats in other genres. If you normally read westerns, read sci-fi. If you normally read fantasy, read mainstream. You may discover that you really like tales where the main character has to solve a murder, though you think it would be better if the tale were set aboard a space station orbiting planet Z55quash. Read tales from the East: *1001 Arabian Nights. Tale of the Gengi. A Day in the Life of Ivan Denisovich.* Perhaps the code of the samurai will work perfectly for your military sci-fi story. You never know what you may discover that will help your writing.

Write each day.

Write whenever you can. In the car, on the way to school. In the lunch-line. During study hall. After school. Write as a break from studying and type while you talk on the phone. If you take your journal everywhere, then it'll be with you if an odd piece of inspiration strikes while you're waiting in line for a deli sandwich.

Put your heart and soul into your writing.

Day by day, hour by hour, minute by minute, writing demands dedication and perseverance. For me there came a time when I had to choose between writing for 20 or 30 hours a week and continuing with conventional schooling. I wanted to enroll in adult fiction writing classes, which I could never have done in a traditional school setting. So my parents and I decided to homeschool.

One day I may work for ten hours on "school," and the next, write stories for several hours. When *PBS Online* contacted me to ask if I could quickly write an essay on the conflict between Ethiopia and Eritrea, I was able to write for several hours during the next couple of days and get the project out.

You, *Imagine* reader and budding writer, may also have to make some choices about how to spend your time and what is really important to you. Of course, you may not want to withdraw from formal schooling. Sacrifices mean different things to different people. Back when I did go to regular school, I would wake up at 5:00 a.m. just to think about my writing before getting ready for school. You may find yourself cutting one of your extracurricular activities to make more time, or considering whether it is really necessary to watch *Sunset Beach, Dawson's Creek,* and *Ally McBeal.*

Don't forget your audience.

I've learned some very important lessons about audience, perhaps the most important of which is that I'm not just writing for me, though it may seem like it at times. I must write to engage the reader, to grab the reader's attention and never let it go. This is hard because each of us is tempted to write only for ourselves. You may expect that the reader will "get" everything, but they won't if your writing's murky or obscure, or if you haven't explained things enough.

Seek criticism.

This is one of the best ways to keep your audience in mind. You may find it useful to start a peer review group among your friends, or join a community of writers. By having others read your work, you learn what works and what doesn't, what

Writer

people like and what grates on their nerves. Still, don't accept criticism blindly. Pay attention to who is criticizing. Because I write fantasy and science fiction, I value far more the opinion of a friend who's read half the speculative fiction books in the bookstore than the opinion of someone who's not well-read in my genre.

It also helps to have a critic who, while cognizant of the needs of a reader, also keeps in mind the needs of the writer. This is what I call the "sympathetic critic." Even when early work is pure drivel, he or she doesn't tell you. Instead, this person helps you find ways to make it better, encouraging you to keep writing with the knowledge that you'll get better. The sympathetic critic helps you work out your plots, reminds you when something needs more organization, and is always there when you need him or her. For me, this person is my mother. But no matter who this person is for you, what's important is that you find someone who believes in you and your writing.

> "I must write to engage the reader, to grab the reader's attention and never let it go."

Enter (and keep entering) writing contests.

Two years ago I submitted an essay to the United States Institute of Peace Essay Contest on war crimes and accountability, but didn't win an award. Since then, I have grown as a writer, taken online fiction writing courses through UCLA, and written all I can. I also practiced writing for the writing component of the Advanced Placement exams. When the time came again to enter the Peace Essay Contest, my writing had improved substantially. This time, I became the 1999 Texas state winner and won a $1,000 scholarship for college. Writing contests provide opportunities not only to make money, but also to measure your improvement from year to year, to win awards that will look good on your transcripts, to get published, to challenge yourself, and to learn and grow in your writing ... though not necessarily in that order.

Seek opportunities to get published.

Before I found out I'd won the Texas state award for the Peace Essay, I sent portions of my essay as an editorial to local papers. Three papers published my opinion/editorial. Try to get published as much as possible, even if it's only in the small press and local papers. Which looks more impressive on a query letter to an editor: "New writer, never published" or "New writer, has published articles in three local papers on the crisis in Kosovo and articles about the Clinton impeachment and the Eritrean/Ethiopian conflict on *PBS NewsHour* online"?

Look for new ways to learn.

I have found distance learning a great resource. The number of online courses has multiplied unbelievably in recent years. I took an online course on writing the novel. Because of the anonymous nature of online classes, no one knew that I was only 16. I was treated as a peer and judged on the basis of my writing, not my age or grade. This was great! [Editor's note: see page 17 for some distance learning options for writers.]

Revise your work.

First drafts are *supposed* to sound awful. Otherwise, people wouldn't make second and third drafts. And tenth. The beautiful prose you find in books is like that not because the author sat down and said, "I think I'll write beautifully today" but because he or she sat down and said, "I think I'll rewrite again today." Looking at each chapter, each passage, each sentence, each word, the writer asked, "How does this affect the work as a whole? Could a different word do the job better? Can I make this sentence do more work? Is this scene really necessary?"

The first time through a story, I don't worry much about style or technique; I just write. Later, I go back, type it, put in paragraphs, impose decent grammar, and generally try to whip it into some semblance of shape. I once began a story ten pages too early, two years too late, and two days too early. Don't ask me how. To fix it, I needed to find out where the beginning lay. I asked myself, "When did my protagonist's world change?" I discovered there were two incidents that changed her life, but I'd written them two years apart. This didn't make for heart-pounding, edge-of-your-seat reading. It made for boring reading. So I forced myself to revise.

When you come back to a particular work after a long time and it seems like a monstrosity, remember that it only seems that way because you've become that much better at writing since you first wrote that piece. The worse something looks to you, the better you are becoming, and the better the revised piece will be.

Heather M. Jones, 17, is a junior at PATHfinders College Preparatory Home School in Richardson, TX. In her spare time she enjoys writing science fiction and fantasy, learning jiu jitsu, talking with friends, reading, volunteering at Zale Lipshy Hospital, and mentoring a child with Asperger's Syndrome.

Making Contact:

by Melissa Hartman

As a writer, you'll eventually find yourself in one of these situations:

You've written a powerful story or poem. You've had it critiqued by other writers—whether students, teachers, or both—and polished it until you couldn't be happier with it. Now you want to see it in print.

Or you have a great idea for an article. Maybe you visited family in another country and discovered, for the first time, what it means to be German or Chinese or Indian. Or maybe you participated in a competition and learned a lot about a subject and yourself. You think that many other people would be interested in your experience and want to write an article about it. But would a magazine or newspaper be willing to publish it?

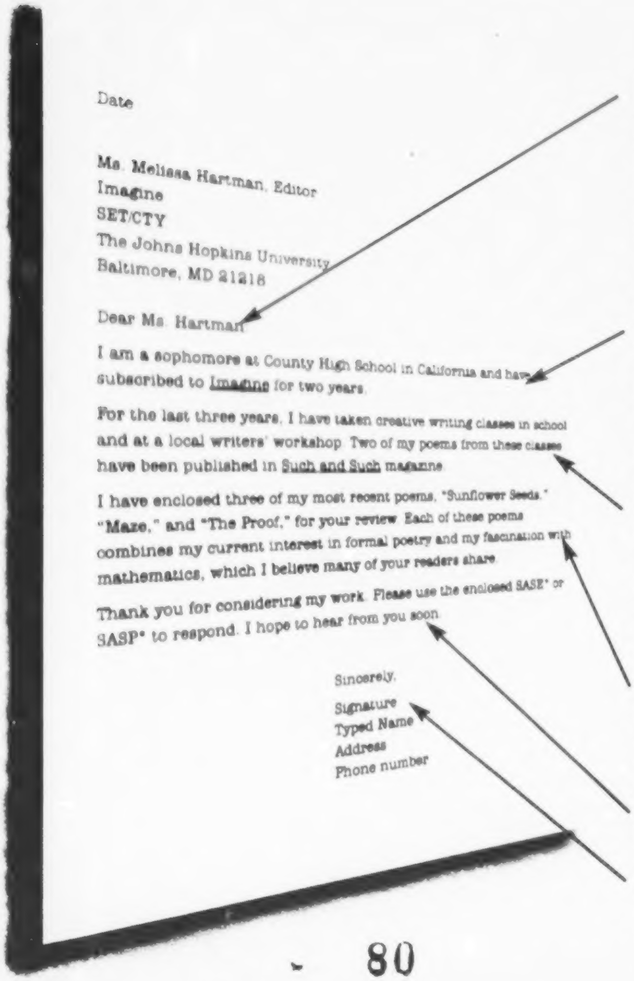
In both situations, the next step is to make contact with an editor.

Allow Me to Introduce Myself ... and My Writing

To understand how important that first contact is, put yourself in an editor's shoes. You're sitting at a desk mounded with paper when the next batch of submissions arrives. From one envelope you pull a 15-page story; from the next, three poems; and from another, a 5-page article. And that's just the top of the stack. You know that you can't read them all today and that more will arrive tomorrow. How do you decide which pieces deserve your most serious attention?

Often, the answer lies in the letter enclosed with the submission. A cover letter should convince an editor—in just one page—that your work is worth reading and, ultimately, worth publishing in her magazine. A good cover letter might rescue your story or poems from the "slush pile" (that ever-growing mound of submissions), while a careless one can quickly redirect your work to the pile of rejections.

So what do you say in this all-important letter? Here's an example adapted from effective letters we've received at *Imagine*:



Date

Ms. Melissa Hartman, Editor
Imagine
SET/CTY
The Johns Hopkins University
Baltimore, MD 21218

Dear Ms. Hartman

I am a sophomore at County High School in California and have subscribed to Imagine for two years.

For the last three years, I have taken creative writing classes in school and at a local writers' workshop. Two of my poems from these classes have been published in Such and Such magazine.

I have enclosed three of my most recent poems, "Sunflower Seeds," "Maze," and "The Proof," for your review. Each of these poems combines my current interest in formal poetry and my fascination with mathematics, which I believe many of your readers share.

Thank you for considering my work. Please use the enclosed SASE* or SASP* to respond. I hope to hear from you soon.

Sincerely,
Signature
Typed Name
Address
Phone number

Be sure to address the editor by name whenever possible. This shows that you have read the publication, and, importantly, people are more likely to read letters addressed specifically to them. Make sure that you take the editor's name from the most recent issue of the publication.

A short introduction is all that's necessary. You don't have to include your age, and might not want to if you're submitting to a publication that doesn't normally publish kids' work. If you enjoy reading the magazine, say so. This shows that you've considered your work within the context of the publication.

Include writing credits if you have them. If you don't, you can still include your writing experience—something that shows that you enjoy and are serious about writing.

An interesting detail about the work or an intriguing summary of a story's plot can be effective. Linking the work to something you've read in or observed about the magazine can also be helpful.

Be polite. Thank the editor for his or her time, which you now know is very scarce.

Put your name on each page of your submission as well, just in case pages get separated from your letter.

Cover Letters and Query Letters

Remember that your goal is to make the editor want to read your writing. Keep the letter brief and make sure it's completely free of spelling and grammatical errors. And then let your poems or your story take over.

I've Got an Idea!

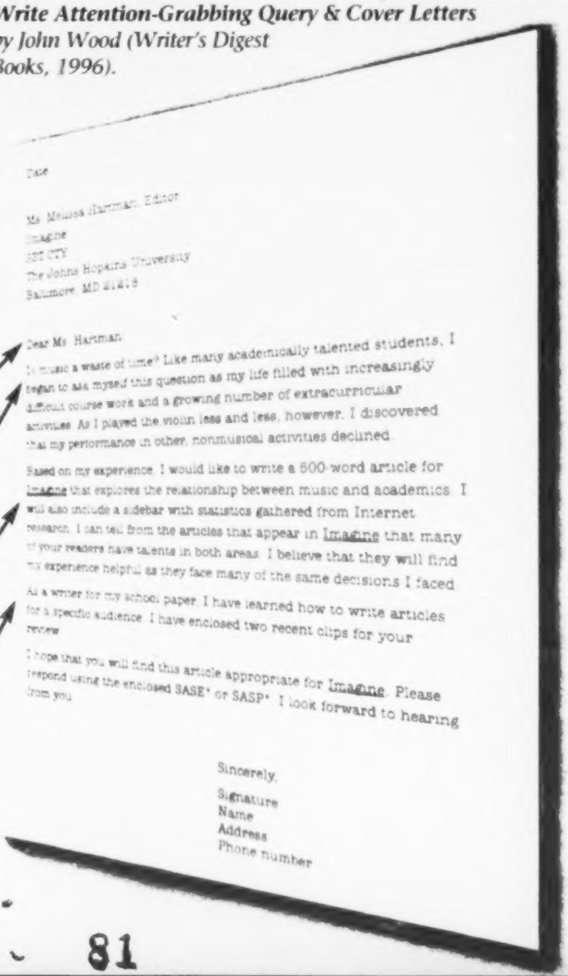
Unlike stories and poems, which are usually submitted in their entirety and unsolicited, magazine and newspaper articles are most often written under editorial direction. But if you're not on the staff of a magazine or newspaper, how do you get to write for one?

Ask. The purpose of a query letter is to propose to a specific editor that you write a specific article for that specific publication. Unlike a cover letter, which "sells" the manuscript it accompanies, a query letter must convince the editor of your ability to write a viable article that you haven't yet written. Here's one approach:

Now that you've got the idea for an article or a finished piece that you want to publish, look for the right magazine or newspaper. See page 14 for some publications that accept student writing, and then get those letters in the mail. Somewhere out there is an editor looking for that gem in the slush pile.

**SASEs and SASPs: Self-addressed stamped envelopes and postcards improve your chances of getting a response from an editor. Use an SASE if you would like your manuscript returned; use an SASP if you'd like acknowledgment of receipt of your manuscript or just a quick yes-or-no response.*

For more advice about query letters, see Victoria Claire's Query Letter Information at www.accelnet.com/victoria/queries2.html or check out ***How to Write Attention-Grabbing Query & Cover Letters*** *by John Wood (Writer's Digest Books, 1996).*



Date

Ms. Melissa Hartman, Editor
Imagine
IAAY CTY
The Johns Hopkins University
Baltimore, MD 21218

Dear Ms. Hartman:

Is music a waste of time? Like many academically talented students, I began to ask myself this question as my life filled with increasingly difficult course work and a growing number of extracurricular activities. As I played the violin less and less, however, I discovered that my performance in other, nonmusical activities declined.

Based on my experience, I would like to write a 500-word article for Imagine that explores the relationship between music and academics. I will also include a sidebar with statistics gathered from Internet research. I can tell from the articles that appear in Imagine that many of your readers have talents in both areas. I believe that they will find my experience helpful as they face many of the same decisions I faced.

As a writer for my school paper, I have learned how to write articles for a specific audience. I have enclosed two recent clips for your review.

I hope that you will find this article appropriate for Imagine. Please respond using the enclosed SASE* or SASP*. I look forward to hearing from you.

Sincerely,

Signature
Name
Address
Phone number

It's even more important in a query letter than in a cover letter to address the editor by name. Query letters must be tailor-made for each publication and, sometimes, for a specific department within the publication.

One effective strategy is to use a lead that could also be the first paragraph of the article. Another option is to jump right in to your proposal.

Why would this magazine be interested in such an article? Remember, you are trying to sell your pitch to this particular magazine. Include details about the format you envision, possible sources you'll use, and information about photos or other visuals you can provide.

Now convince the editor that you are the right person to write the article. Enclose clips if you have them or emphasize your expertise in the area you're writing about.

BEST COPY AVAILABLE

To Observe, To Think, To Q

by Nick Sheff

My father wasn't around much since he had started dating another woman, and my mother had long since run off with another man to Los Angeles. So I began walking. I walked alone through the streets of San Francisco. The women and transvestites outside the burlesque theaters would blow me kisses as I passed by. I imagined they were comic book super heroes with their glittering underwear and jewel-studded boots. The homeless men with their dirty stray dogs knew me by name. They asked me about school and showed me magic tricks with a deck of cards or a hard-boiled egg. I examined their faces: broken and perplexed.

It was around this time, when I was seven, that I began to feel as if a stranger had taken over my small body. Alone and exposed to so much at that young age, I was forced to live life as this awkward creature, neither grown nor a child. I felt as if I were a ghost watching everyone through a distorted lens. I couldn't relate well to my peers and I obviously was not ready to take on the emotional burdens of adulthood. Scared, I withdrew further.

My father finally recognized my intense anxiety and arranged for me to start seeing a therapist. We parked outside the old wooden building hung with purple wisteria and I got out of the car. The therapist was a short woman with pale skin that appeared to be nearly translucent. She wore thick glasses and smelled of talcum powder. Pensive and nervous, I squirmed in the big chair and tried to explain what was wrong. "Do you ever write or draw?" she asked. I told her I did a little bit. She said that she wanted me to go home and write a poem and draw a picture about how I felt.

I went home that night and wrote a short poem. I titled it "The Outsider." Then I drew. Monsters. People without faces. Screaming parents towering over a tiny child. I drew for hours. It would be an oversimplification to say that I felt completely better afterwards, yet something changed. It was as if I could finally get out what had been locked inside.

Over the years, I continued talking to the therapist and wrote and drew with passion. My father married a wonderful woman, a painter. She bought me charcoal, paint, and canvases, and together we worked in her studio. I began meeting her friends—other artists and writers. I was inspired not only by their talent but by the way they viewed their art as a tool to describe and investigate their internal conflicts as well as the complex, intricate layers of the larger world. I loved how they used their art both to mirror and to challenge the status quo.

I discovered books and began reading everything I could get my hands on: Salinger, Hesse, Baudelaire, Neitzche, Bukowski, and Rimbaud. I went to museums and galleries and pored over art books about Basquiat, Pollack, Duchamp, Ocampo, and Picasso. Through their remarkable work, I saw the ultimate potential of art: its profound ability to cut through the surface and reach toward the sublime. I was moved by the way that they were able to transform their plight, or the plight of others, into truth and beauty. The world began to take on a whole new appearance. I felt an air of possibility and excitement hovering over those same streets that had once seemed so dark and oppressive. My mind was alive with the potential I felt: to observe, to think, to question, and to create.

It wasn't until high school, however, that I first became excited about the way I could make a difference through journalistic writing, particularly writing personal columns. My sophomore year, I joined the student newspaper and wrote my first opinion piece about the Clinton sex scandal. I was not at all prepared for the reaction those 800 clumsy words would receive. I said that the president's personal life wasn't relevant to his job, and parents and teachers were outraged. They phoned and wrote letters criticizing my "lack of morals." I was delighted. I had received my first real taste of the power a column can have.

Last year, I submitted an essay about long-distance joint custody to *Newsweek*. In the piece, I drew more controversial conclusions: about the custody arrangements imposed in many divorce cases (including my parents' and the parents of many of my friends). After it was published in the magazine's "My Turn" column, I received hundreds of letters from a wide variety of people, including a 15-year-old teenager in a situation similar to mine but who was suicidal, a mother who was in the middle of a custody battle, and a 70-year-old veteran who said that he now regrets that he forced his children to divide their lives between their parents in two cities. A number of letters came from judges, family lawyers and therapists who said that the column will influence their future joint-custody cases. Since my goal was to make people reconsider this form of custody, the response seemed extremely hopeful.

I've also sought to examine the complexities of many other social and political issues. My columns—about affirmative action, subtle racism among students, the Littleton shootings, the war in Kosovo, the controversial "Sensation" art exhibition at the Brooklyn Museum, and more—have been about the need for tolerance and self-examination and the danger of hypocrisy.

tion ... To Write

I realize that it often seems there is no way to make a difference in our society. In exasperation, people often just become apathetic, tired of it all. When he worked as a columnist, Charles Bukowski wrote, "What's there to say about politics and world affairs? Are there good guys and bad guys? Some that always lie, some that never lie? Are there good governments and bad governments? No, there are only bad governments and worse governments." He goes on to conclude that there is no way to fight this because nothing will ever change. He felt writing about world issues was a waste, so he didn't. Though I understand this point of view, my experience has shown that one person can make a difference. It may be very small, but at least it's a start.

It is infinitely important to articulate and try to publish your thoughts. Writing has always been a catalyst for change and progress. My columns as well as my other art pieces have become integral parts of my existence. I use them to join my inner and outer worlds. They are not only my therapy, but also my means of discovery. They are my way of expressing concern, hope, and celebration. They are the way I ask and try to answer the great questions inherent in life. They are the way I explore the kind of life I want to live and the type of person I want to become. They are the way I can be heard and try to effect social change.

A senior at Marin Academy in San Rafael, CA, ***Nick Sheff*** *has published his work in* Newsweek, *the* San Francisco Chronicle, *and* Collage *magazine as well as in his school's newspaper. Last year, two of his columns, "The Silver Bracelet" and "Parents Do Matter," won first place in the Ernest Hemingway Writing Awards for High School Journalism. You can read these articles online at www.kcstar.com/aboutstar/hemingway/hem5a.htm*

For more information about the Hemingway Writing Awards, see page 15.

BEST COPY AVAILABLE

Words

by Tanya Wolters

Words are just words,

until *you write them down.*

Then *the words that were just words*

are *suddenly keys to a whole new world.*

You *can save the world from destruction;*

discover *a treasure chest; be a flower!*

Words *let you be anything you want.*

You *can live a thousand different lives;*

rewrite *history with the click of a pen.*

Words *give you escape routes, a way to run away*

without *leaving your paper.*

And *when you want to go home, simply write "the end."*

Tonya Wolters *is an eighth grader at Oak Crest Middle School in Encinitas, CA. Tonya enjoys cheerleading, reading, writing, playing the piano, and participating in church activities.*

"Writing a poem is discovering."
—Robert Frost

PENNING THE IMPOSSIBLE:

Writing and Publishing Science Fiction and Fantasy

by Yoon Ha Lee

Maybe you've dreamed up spindrift faerie worlds or wars that span the stars, or stayed up late at night reading books by Robert Heinlein and Anne McCaffrey. Maybe you're ready to begin the arduous process of writing your own science fiction and/or fantasy stories. "But I'm just making things up," you say. "How hard can it be?"

Pretty hard, actually.

Learn the Genre

"Research" for writing involves becoming familiar with the genre(s) as well as related content areas: ancient history, astronomy, or whatever interests you. Chances are that you already read sf/f. If so, good—go and read some more.

In the process you will discover a great many things, including the conventions of sf/f, the "rules of the game." A well-meaning teacher once looked over one of my stories and suggested that I explain what "runes" are. Few modern fantasy writers would bother, because "runes" have passed into the genre's common vocabulary of ideas. Likewise for ftl (faster-than-light) travel, telepathy, and others.

You may find subcategories in sf/f: hard sf, heroic fantasy, military sf, and urban fantasy, just to name a few, all with their own conventions. You'll also learn what's been done before. Your idea may seem blazingly original—until you see it in a 40-year-old novella. Don't think it can't happen to you. One of my friends independently came up with the premise for Cherryh's novel *Cuckoo's Egg*, albeit years after it was published.

In the course of your reading you may also run across "how-to" books on writing fiction in general or writing sf/f in particular. Both are worth a look, though no writer's advice (including mine) is gospel; what works for one might not work for another. General "how-to" books are less useful because mainstream writers don't usually worry about portraying extraterrestrial environments or nonexistent languages. When it comes to genre rules, trust what you've seen in sf/f.

Make it Real to the Reader

Your research is important because you're dealing with worlds of the fantastic, and in a good sf/f story, you need to establish the rules of your world. Reading others' works will both help you learn how others have dealt with this problem and inspire your own approaches.

"The story's speculative," you say, "and thus anything can happen." But if that were true, where would be the conflict? As in life, there must be limits; the magical sword or the world-destroying starship must have its cost, else there will be no story. In fantasy, this often manifests as "rules of magic," whether by ritual, sacrifice, or other means. In science fiction, this may mean plausible (if not possible) extrapolation of the universe's laws and existing technology.

This is the challenge of sf/f: working out a strange concept's consequences so they become real to the reader. For example, I've wondered what social institutions would have developed to regulate magic, if magic existed. Or perhaps why a technologically-advanced society would measure age in percentages rather than years. You'll have your own speculations.

However, you are still burdened with the more traditional concerns shared by mainstream writers: grammar, mechanics, characterization, style ... and entertainment. Find people who know something about sf/f and are willing to read your stories. Take criticism gracefully; few of us are infallible. But also remember that it's your story, and if your judgment tells you to disregard advice, that's your call. Get several opinions, in case you've written about elves and your first reader just happens to detest elves.

> “What an editor considers a good story is unlikely to coincide with what your AP English teacher or best friend thinks is a good story, unless said teacher or friend is a sf/f aficionado, and even then it's iffy.”

The Business of Writing

Sooner or later you'll conclude that your story is good, maybe even good enough to publish. It's time to stop and do some more research. Do you know what proper manuscript format is? What contact information to put on the cover letter or front page? How much professional magazines pay per word? If the answer is yes, you're a rarity. The rest of you should read up on the business of writing.

That's right: if you're trying to get published, writing is a business, whether or not you actually get paid. As a beginner, you may get copies of the magazine rather than a check. This brings us to a common myth: writing is lucrative. You can guess how much Robert Jordan makes from his *Wheel of Time* books, or Orson Scott Card from his *Ender* novels, right? Alas, most of us aren't that talented or well-established. Short stories, in particular, won't net a beginner more than $500 per. That sounds like a lot compared to your weekly allowance, but it's not enough to live on, if you write three stories a year. You can live off novels if you're prolific enough, but if you spend every night doing math homework or writing literary commentaries, you probably haven't written a novel, let alone a sellable one.

Learn Your Markets

Acceptances aren't automatic. They're gratifying: there's nothing like knowing that an editor was willing to bet cash that other people would enjoy reading your story. But for that reason, stories are hard to sell. What an editor considers a good story is unlikely to coincide with what your AP English teacher or best friend thinks is a good story, unless said teacher or friend is a sf/f aficionado, and even then it's iffy.

Which is why even more research is necessary. Know your markets. The Science Fiction and Fantasy Writers of America have an excellent Web page at www.sfwa.org with many links. Another good source for sf/f magazines and open anthologies (those that aren't by invitation only) is *Writer's Market*, which is published yearly; if the guidelines aren't listed, send off for them. Guidelines tell you what the editor is willing to buy, thus saving your time and the editor's.

Subscribe to magazines that interest you, or look for them at the library. If that isn't possible, send off for a sample issue or look for Web sites (which sometimes include previously published stories and/or guidelines). You might as well submit to magazines that you like to read. Recent sf/f anthologies are another useful resource if magazines are hard to find.

(Gulp) Send It In!

Once you've come up with a worthy story (you hope) and suitable markets, it's time to send it in. Start with the top markets and work your way down, since the more they pay (if anything), the more selective they are. Unless you're incredibly lucky, your first responses will be rejection slips. Yes, it hurts. No, it's not the end of your writing career. Let the story sit for a while, then go back and see how you can improve it. Sometimes it's fine and the editor just has too many dragon stories that month (a common occurrence, I hear). Sometimes the editor doesn't like your style; try another market. You may never know the reason, but you can always keep writing.

Finally, and most importantly, be persistent. Breaking into markets (especially the better markets) is difficult. I started submitting professionally in ninth grade, and it took four years and over a dozen rejection slips to make my first sale—to a 'zine near the top of the field. It happens. If the editor rejects the story but comments personally on your work, take it as a good omen: many don't bother unless they think you have potential. And if instead you get the coveted acceptance letter and check, congratulations! Within several months you'll be in print.

A junior majoring in math at Cornell University, ***Yoon Ha Lee*** *has sold three stories to* The Magazine of Fantasy and Science Fiction. *In addition to sf/f, her interests include beadcraft, weapons & tactics, role-playing games, languages/linguistics, and history of science and technology. Check out her Web site at yhl.freeservers.com for additional thoughts on writing as well as recommended books and stories.*

A Summer at Detroit Free Press

by Simone Sebastian

If I had been asked when I started high school what professions I was considering, journalism would have been near the bottom of my list. I had always excelled in math and science and set my sights on fields such as computer science and engineering. I'll never forget the silence on the other end of the phone a few years ago when I called my father, an engineer himself, with the news of my significant change of interest.

The Accidental Journalist

I was almost as astonished as my father was by my newfound passion for journalism. I tried out for the newspaper staff simply to fill the empty slot in my junior-year schedule. Only five underclassmen made the staff that year, so my first few months were pretty intimidating. Twice my story ideas were stolen by seniors, and I often overheard the editor-in-chief talking about "the new girl who can't write," assuming she meant me.

Then one day I overheard two editors discussing a story a staff writer had turned in. "Look at this article. It's great! Who's ... Simone?" I whirled my head around as the editor-in-chief pointed in my direction. "This story is great, Simone. Keep up the good work."

The following year, I accepted the position as news editor. My passion for writing and reporting grew each day. The endless opportunities to disclose issues within my school and community thrilled me in ways even calculus hadn't. Friends started approaching me for help in AP English instead of AP Chemistry. My college plans strayed from schools like MIT and Caltech to liberal arts schools like Emory and Columbia. It was no longer the math and science competitions that teachers and counselors recommended to me, but essay contests and scholarships for students interested in the social sciences. It was the faculty advisor to the newspaper who referred me to the *Detroit Free Press*/Knight Ridder scholarship, which offered $1,000 to a minority high school senior in the Detroit area with an interest in print journalism. It seemed that no sentence defined me better; still, I was unable to compose myself when I was told that I had won not only the scholarship but a summer internship as well.

As excited as I was to have won, I had no idea what I was getting into. Holding the stereotypical "fetch my coffee" internship as standard, I simply saw this as an opportunity for an early start on my résumé. My expectations were surprisingly low when I walked into the *Detroit Free Press* building on my first day, but I would soon discover exactly how little I knew about my "passion."

Overconfidence Killed the Intern

It didn't take long for me to notice differences between high school and professional print journalism. Editors now deleted from my stories the flowery writing that had won me so much fame in school, calling it "excessive." As news editor, I had always encouraged staff writers to be creative—avoid using the same word to begin several sentences; remember that people can do more than simply "say" something, that they can argue, respond, and even "exclaim with a trace of irritation;" and never forget that adverbs and adjectives are every writer's best friends. But all this was "unnecessary" according to the copy editors. I spent most of my first day reading through their 90-page style book full of rules and regulations about what reporters could and could not write.

When I finally added the byline to my first "professional" article, a news story about a suspected drug problem in a local suburb, I could hardly contain my excitement. I had spent the previous night interviewing residents and thinking of good leads. Unfortunately, my editor wasn't as excited. "Well, I figure we should just delete this whole first paragraph ... it's about 40 words too long." I tried to hide the shock as I watched my hours of work disappearing with the cursor running across the screen. I sat at my editor's desk for almost a half-hour, watching as he deleted, cut, pasted, and pretty much rewrote my article. When he finished, half of the sentences started with "the," every quote was introduced with "he/she said," and searching for an adjective was futile. I discovered that, in

EST COPY AVAILABLE

newspaper journalism, creativity isn't a priority. One of my editors later admitted that it's rare to find a journalist who's both a good reporter and a good writer; but the good reporters—those who can find the best sources, ask the right questions, and get the stories first—are in much greater demand.

Time Flies When You're on Deadline

During my interview for the scholarship, I was asked what personal characteristic was the biggest hindrance in my aspiration to become a journalist. Without much need for thought, I responded that my habit of procrastinating made deadlines my worst nightmare. Through their uncontrollable laughter, the interviewers responded, "Journalists don't procrastinate; we say we're just really good with deadlines."

> “When I finally added the byline to my first "professional" article, a news story about a suspected drug problem in a local suburb, I could hardly contain my excitement.”

Writing for a monthly high school publication hardly prepared me for the hectic atmosphere of a professional daily newspaper. From 10:00 a.m. to 2:00 the following morning, every hour signals a new deadline. In school you're usually allowed a couple of weeks to write a story, but at a daily, you may be given a press release at noon and be expected to have a completed article by 4:00. And there's much more to it than finding a few of your friends to comment on the new cafeteria food. That four-hour period includes tracking down sources, searching through archives, organizing the quotes and information, taking a 15-minute lunch break, and eventually writing the story. This can be a major problem, particularly for those who can spend 30 minutes just trying to come up with the perfect lead.

Being used to the flexible time allotments of our monthly publication, I had to learn the importance of deadlines the hard way. Halfway through the summer, I was assigned my first obituary on the same day I had scheduled an interview for another story. Confident that I could manage both tasks, I returned from the interview around 3:50, prepared to complete the obituaries by 6:00. But as I turned on my computer, a list of urgent messages scrolled down the screen: "Simone! It's 3:00, obits are due in an hour, the file is empty, and we can't find you!" And the final message: "It's 3:45 and I have no idea where you are, so I'm turning over the assignment to someone else." It was a difficult experience, and it took a while for that editor to trust me on a deadline again. So I learned the hard way that in journalism, everything has a deadline carved in stone.

A Story is Only as Good as Its Sources

In high school, I had become accustomed to interviewing people my own age, whom I knew and saw on a daily basis. Now my sources were total strangers and prominent people in the community. This was intimidating, particularly when my high-pitched voice, unfamiliar name, or nervous stuttering alerted them to my youth. Often, prominent city figures, such as the chief of police and mayor, have close business relationships with reporters at the newspaper, especially those with police beats. That familiarity makes it easier for a reporter to get important facts and inside information that a source might be hesitant to give otherwise. My inexperience often hindered my ability to get good information. However, I eventually learned to take advantage of other reporters' relationships with sources. When using a source for the first time, I would first introduce myself, and then mention that I had received his name from another reporter with whom he was on good terms. Almost always, this made the conversation more comfortable and the source more trusting.

Even more important was the effect the sources had on my enthusiasm for a story. Because the scope of the *Detroit Free Press* was much larger than that of my school newspaper, for the first time, I was being given stories that had absolutely no effect on me. During the summer, I covered a story centered on a debate over the construction of a community center in a local suburb. The story

Continued on page 34

Writing Resou

Where to Submit Your Writing

The titles listed below are only a few that publish student writing. See the ***Market Guide for Young Writers*** *(see "Books to Help You Improve Your Writing") for more titles like these as well as some adult journals that accept student work. And don't forget* ***Imagine!*** *You can find our editor's mailing address in the masthead on page 3.*

The Apprentice Writer

Gary Fincke, Writers' Institute Director, Box GG, Susquehanna University, Selinsgrove, PA 17870. Deadline: March 15, 2000.

Published each September, *The Apprentice Writer* features the poetry, prose, and photography of students in grades 9–12. Of the 5,000 submissions to the 1999 edition, about 90 were published in the 64-page newspaper-format literary magazine.

The Concord Review

Will Fitzhugh, Editor and Publisher, P.O. Box 661, Concord, MA 01742; www.tcr.org. Rolling submissions.

High school students may submit essays of 4,000–6,000 words, with endnotes, on any historical topic to this highly-regarded quarterly review. Published essays are also considered for one of three Emerson prizes, awards of $3,000. Sample winning essays and submission guidelines are available on the Web site.

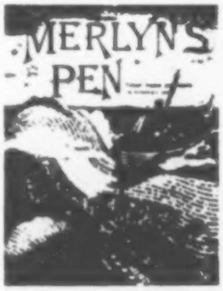
Creative Kids

Submissions Editor, Creative Kids, P.O. Box 8813, Waco, TX 76714-8813; www.prufrock.com. Rolling submissions.

This quarterly magazine publishes games, stories, poems, and other creative work by kids ages 8–14. See the Web site or write for submission guidelines—improper submissions will be discarded.

Merlyn's Pen

Merlyn's Pen, P.O. Box 1058, East Greenwich, RI 02818; merlynspen@aol.com; www.merlynspen.com. Submit by April 1 to be considered for next year's edition.



This annual publication showcases essays, stories, and poems written by students in grades 6–12. Students must include the official cover sheet (available on the Web site or by writing or sending e-mail to the publisher) with their submissions, as well as $1 for a response only or $5 for a response and comprehensive critique.

Skipping Stones

Skipping Stones Magazine, P.O. Box 3939, Eugene, OR 97403; www.treelink.com/skipping/main.htm. Rolling submissions.

This bimonthly magazine features the writing and art of children ages 7–18 from around the world. Submissions may be in any language; works are published in the language in which they are submitted, with an English translation.

Stone Soup

Ms. Gerry Mandel, Editor, Stone Soup, P.O. Box 83, Santa Cruz, CA 95063; www.stonesoup.com. Rolling submissions.

Students through age 13 may submit poems, stories, and art to this bimonthly magazine. Only submissions with a SASE will receive a response. Book reviewers and illustrators should query first. A sample issue and submission guidelines are available on the Web site.

Writes of Passage

Writes of Passage, P.O. Box 1935, Livingston, NJ 07039; www.writes.org. Rolling submissions.

This biannual literary journal features poems and stories by students ages 12–19 as well as articles about writing by established writers. A Teacher's Guide is also available for each issue, allowing high school teachers to use the works of teens to teach creative writing.

BEST COPY AVAILABLE

SALLY FORTH HOWARD & MACINTOSH

MOM, DO YOU HAVE ANY TIPS FOR WRITING AN AWARD-WINNING STORY?
I'M SURE IT'S LIKE ANY OTHER TASK, HILARY. YOU HAVE TO TRY YOUR BEST AND ALWAYS LOOK FOR WAYS TO IMPROVE.
NEVER BE SATISFIED WITH SIMPLY DOING THE JOB. YOUR WORK SHOULD BE THE STANDARD OTHERS ASPIRE TO.
THAT SOUNDS A LOT LIKE THAT SPEECH YOU GIVE ME ABOUT HOMEWORK.
HAVE WE DISCUSSED "THE RECURRING THEME" AS A USEFUL LITERARY DEVICE?
8-12

Reprinted by permission King Features Syndicate

Selected Writing Contests

These competitions are just a sampling of the opportunities awaiting young writers. Space constraints prevent us from listing many of the great writing contests we've learned about in preparing this issue, but you can find links to these and other contests on our Web site at www.jhu.edu/gifted/imagine. For a comprehensive listing of writing contests, see ***The Ultimate Guide to Student Contests, Grades 7–12*** *by Scott Pendleton (Walker and Company, 1997).*

Note that some contest deadlines may have passed for this year. Be sure to keep this list so that you'll know how to enter next year.

Arts Recognition Talent Search (A.R.T.S.)

NFAA/ARTS Program, 800 Brickell Avenue, Suite 500 Miami, FL 33131; (800) 970-ARTS; nfaa@nfaa.org www.nfaa.org/arts.html

This program recognizes high school seniors who excel in dance, music, voice, jazz, theater, photography, visual arts, and writing. Writers may enter in any of five categories: poetry, short story, novel, play or script, and expository writing. Top candidates earn an all-expense-paid trip to ARTS Week in Miami, nominations to the White House Commission on Presidential Scholars, consideration for scholarships, and cash awards of up to $3,000. $35 entry fee. **Deadline:** October 1.

Ernest Hemingway Writing Awards for High School Journalists

Lisa Lopez, Hemingway Awards, The Kansas City Star, 1729 Grand Boulevard, Kansas City, MO 64108; (816) 234-4907; www.kcstar.com/aboutstar/hemingway/hem2.htm

High schools may enter submissions by two students in each of four categories: feature writing, news writing, sports writing, and commentary. Submissions must have appeared in a student publication in the previous school year. First-place winners receive $2,500 and a trip to Kansas City for an awards banquet. **Deadline:** January 15.

National Council of Teachers of English Contests

NCTE, 1111 W. Kenyon Road, Urbana, IL 61801-1096; www.ncte.org/grants/

Achievement Awards in Writing: English departments nominate high school juniors for these awards. Each nominee offers two writing samples for judging: a timed impromptu theme written under teacher supervision and a sample of prose or verse that the student considers his or her best work. Up to 876 winners are recognized with certificates and letters of recommendation to colleges. **Deadline:** January 21.

Promising Young Writers Program: Teachers nominate eighth-grade students for recognition in this program. As in the Achievement Awards, nominees offer for judging both an impromptu writing and a sample of their best prose or poetry. **Deadline:** January 10.

National Federation of Press Women High School Journalism Contest

NFPW, P.O. Box 5556, Arlington, VA 22205; (800) 780-2715; presswomen@aol.com

Students in grades 9–12 enter submissions to their state contests in editorial, feature, review, news, sports, column, feature photo, cartooning, single page layout, or graphics categories. Winners advance to nationals, where awards in each category include certificates, $100 cash for first place, and plaques for second and third place. **Deadline:** State deadlines are usually on or before February 20. Inquire at address above to find your state coordinator.

National Peace Essay Contest

United States Institute of Peace, National Peace Essay Contest, 1200 17th Street NW, Suite 200, Washington, DC 20036-3011; (202) 457-1700; www.usip.org/ed/Programs/NPEC/npec.html

With the sponsorship of any school, school club, youth group, community group, or religious organization, students in grades 9–12 submit a 1,500-word essay in response to the year's topic. State winners, who receive $1,000, receive an all-expenses-paid trip to the awards ceremony in Washington, D.C. There, the prizes of $10,000, $5,000, and $2,500 are presented to first-, second-, and third-place winners, respectively. **Deadline:** Submissions must be postmarked by January 26, 2000.

Quill and Scroll Society International Writing, Photo Contest

Quill and Scroll, School of Journalism, University of Iowa, Iowa City, IA 52242; quill-scroll@uiowa.edu; www.uiowa.edu/~quill-sc/

Each school may submit two entries in each of 10 categories: editorial, editorial cartoon, news story, feature story, in-depth reporting (individual and team), sports story, advertisement and photography (news-feature and sports). **Deadline:** February 5. An official entry form is required.

Scholastic Art and Writing Awards

The Scholastic Art and Writing Awards, 555 Broadway, 4th Floor, New York, NY 10012; (212) 343-6493; GeneralInfo@Scholastic.com; www.scholastic.com/artandwriting/index.htm

Writers in grades 7–12 may submit entries in any of nine categories: short story; short short story; essay/nonfiction/opinion writing and journalism; dramatic script; poetry; humor; science fiction/fantasy; and writing portfolio. Prizes include publishing opportunities and cash awards ranging from $100 to $5,000. **Deadline:** Contact your regional sponsor; some require submissions as early as November.

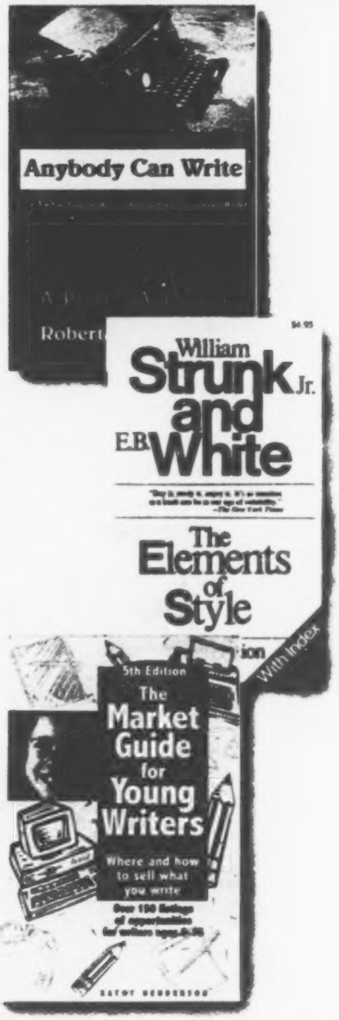
Voice of Democracy National Competitions

To find out how you can participate in these contests in your area, call your local Veterans of Foreign Wars (VFW) office. Some details are available at www.vfw.org/vod/

Youth Essay Contest: Seventh and eighth graders write essays on an annual theme. After winning at local and district levels, students advance to nationals, where prizes range from a $1,000 savings bond for eleventh place to a $10,000 savings bond for first place.

National Audio Essay Scholarship Contest: Students in grades 9–12 tape-record themselves reading an essay of 3–5 minutes that they wrote on an annual patriotic theme. Local winners receive an all-expenses-paid trip to Washington, D.C., for the national judging. The national winner receives a $25,000 scholarship; other scholarships range from $1,000 to $16,000.

Books to Help You Improve Your Writing and Get Published


Anybody Can Write
Robert
William Strunk Jr. and E.B. White
The Elements of Style
With Index
5th Edition
The Market Guide for Young Writers
Where and how to sell what you write
Kathy Henderson

Anybody Can Write: Ideas for the Aspiring Writer, the Beginner, and the Blocked Writer by Roberta Jean Bryant (New World Library, 1999).

The Elements of Style, Third Edition by William Strunk, Jr., and E. B. White (Allyn & Bacon, 1995). (This essential writing guide is now also available online at www.bartleby.com)

Market Guide for Young Writers: Where and How to Sell What You Write, 5th edition by Kathy Henderson (Writer's Digest Books, 1996).

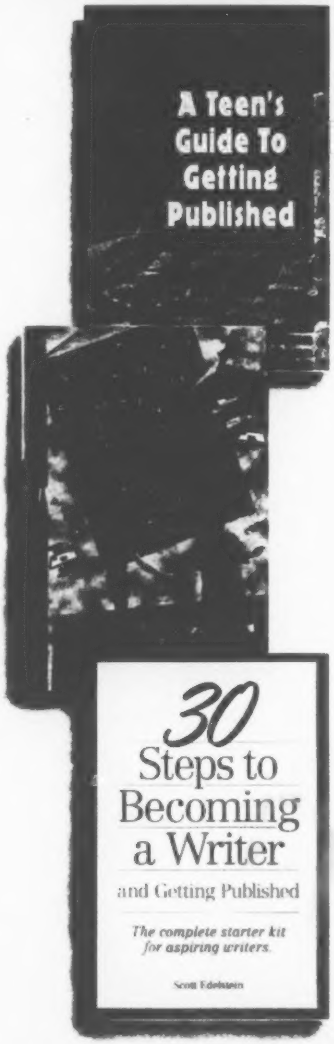
Our Stories: A Fiction Workshop for Young Authors by Marion Dane Bauer (Clarion Books, 1996).

A Teen's Guide to Getting Published by Danielle Dunn and Jessica Dunn (Prufrock Press, 1997).

What's Your Story? A Young Person's Guide to Writing Fiction by Marion Dane Bauer (Clarion Books, 1992).

The Young Person's Guide to Becoming a Writer by Janet E. Grant (Free Spirit Publications, 1995).

30 Steps to Becoming a Writer and Getting Published: The Complete Starter Kit for Aspiring Writers by Scott Edelstein (Writer's Digest Books, 1993).


A Teen's Guide To Getting Published
30 Steps to Becoming a Writer and Getting Published
The complete starter kit for aspiring writers.
Scott Edelstein

Web Sites for Young Writers

For Young Writers
www.inkspot.com/young/
One of the best sites on the Web for freelance writers, Inkspot now has a whole section—full of links, advice, interviews, and resources—just for young writers.

Jobs Page: Your Link to Newspaper Careers
www.freep.com/jobspage/high/index.htm
Considering a career in journalism? Check out this site full of information on internships, scholarships, and ways to improve your journalism skills now.

The Quill Society
www.quill.net/home/index
This free online writing club provides not only writing resources and activities, but lots of encouragement and camaraderie.

The Write Life
welcome.to/thewritelife
This site is geared not specifically to young writers but to writers seeking to improve and publish.

Young Writers' Clubhouse
www.realkids.com/club.shtml
Tips about how to get started and how to get published as well the Young Writers' Critique Group make this a good starting place for aspiring writers.

Learning to Write—At a Distance

The Writing Tutorials

Center for Distance Education,
Johns Hopkins University
Center for Talented Youth,
3400 N. Charles Street,
Baltimore, MD 21218;
(410) 516-0231;
giftedwriting@jhu.edu;
www.jhu.edu/gifted/writtuts

The Center for Distance Education's Writing Tutorials offer courses for students in grades 6–12. Beginning with invention techniques and moving through rhetorical modes of exposition, description, analysis, argumentation, and persuasion, students can participate in a full writing experience that culminates in courses in poetry, fiction, or AP Composition.

Designed by veteran writing instructors from CTY's summer programs, courses are geared to the highly motivated writer. Students complete 12 assignments and receive comprehensive feedback from a tutor. In all courses, a heavy emphasis is placed on the writing process: prewriting, drafting, and revision.

Writing courses are conducted via surface mail or e-mail. Crafting The Essay is also available as a fun, interactive CD-ROM tutorial.

Application Deadline: Apply early for classes beginning in January, June, and September.

Merlyn's Pen Mentors in Writing

Merlyn's Pen Mentors in
Writing Program, P.O. Box
1058, East Greenwich, RI
02818-0964; (800) 247-2027;
merlynspen@aol.com;
www.merlynspen.com

In 12- or 24-week tutorials, students in grades 6–12 correspond through the mail with published writers or editors from the staff of *Merlyn's Pen*, a magazine devoted to the creative work of young writers. The tutorials consist of eight writing assignments designed to help students improve their fiction, nonfiction, or poetry.

These tutorials are noncredit and require no qualifying scores or academic grades.

Application Deadline: Rolling admissions.

LetterLinks

LetterLinks, Center for Talent
Development, 617 Dartmouth
Place, Evanston, IL 60208-
4175; (847) 491-3782;
ctd@nwu.edu;
www.ctd.nwu.edu/programs/ll/
index.html

LetterLinks writing courses include Nonfiction Writing, Creative Writing, Creative Writing—Online, Advanced Creative Writing, and Media and Dramatic Script Writing, all of which are offered for high school credit. Courses run for nine months. LetterLinks instructors are high school teachers experienced in teaching academically talented students. Students mail assignments to their instructors, who correct, grade, and return the work. Students and instructors also speak on the phone.

Registration Deadline: September 15 and May 15.

UCLA Extension Online Courses

Westwood/Extension Building,
10995 Le Conte Avenue, Los
Angeles, CA 90024-2883;
(310) 825-9971;
www.unex.ucla.edu/

In courses of 15 students or less, writers can improve their skills in fiction, nonfiction, or screenwriting. Classes are conducted as workshops, giving students the opportunity to interact with both their peers and their instructors, who are established writers. Classes run for six to eight weeks. Deadline: Technically, two business days before the class begins, but these small classes fill quickly. Request a catalogue online and register early.

For a listing of several other online writing opportunities, see www.worldwidelearn.com/writing-courses.htm

Get Rated. Get into College

The National Writing Board rates serious academic papers by high school students of history and literature against an international standard. These ratings will be offered to college admissions officers to help evaluate prospective students. Both short papers (1,500–2,500 words) and long papers (4,000–6,000 words) will be considered. Deadline: July 1 and December 1, 2000.

For more information, contact NWB, P.O. Box 800, Sudbury, MA 01776; (800) 331-5007; fitzhugh@tcr.org; www.tcr.org

This issue of *Imagine* lists a variety of superb summer programs that allow you to utilize the summer months to expand your learning. The residential programs offer another component—a chance to taste college life, to live in a dorm with other students, to eat with them in the dining hall, to engage in late-night conversations.

The column that follows appeared in *Imagine* a few years ago. It explores the value of a summer residential college experience as preparation for choosing a college and for adapting to college life. We are repeating this column for our newer readers and for our older readers who may now be struggling with how to choose a college.

PLANNING AHEAD FOR COLLEGE

by Linda E. Brody, Ed.D.

Preparing for College in Residential Summer Programs

What are your plans for this summer? Will you take a class? Travel? Seek a summer job? Or use the summer to read and explore topics on your own? The choice of summer activities during your precollege years deserves as much consideration as your classes in school. Though summer may feel far off, it is definitely time to think about what you want to do before deadlines pass and opportunities diminish.

Summer is a wonderful time for learning. You can study subjects that aren't available—or that you don't have time for—during the school year. You can do this in a formal classroom setting or in less structured ways. Whatever your choice, taking advantage of opportunities that extend beyond the school year will enable you to have a broader academic background when you enter college. And including your summer experiences on your college application may make you a stronger candidate for admission.

If your plans this summer include taking a course or two, consider the advantages of a residential program held on a college campus. The talent searches have a long history of offering advanced course work to academically talented students in programs held at various colleges, and the concept has spread so that precollege students heading to class with books in tow are a common sight in the summer on many college campuses.

Residential summer programs offer solid academic course work and much more. You can immerse yourself in rigorous academic content in the company of your intellectual peers while improving your study skills, boosting your motivation, and preparing yourself for the academic challenge of college life.

Living on your own in a college setting can also help develop self-reliance and independence. In most programs, you will live in a dormitory, be responsible for your personal needs such as laundry, and become involved in a variety of social activities. If you spend one or more summers in this environment, you will enter college knowing that you can excel in advanced-level course work, live away from home, and make new friends in a short period of time.

Spending time on a college campus through a residential summer program can also help you in your college search. Even if you have no interest in attending the college at which you spend your summer, you can use the experience to identify characteristics that are important to you. Are you likely to be more comfortable on a large or small campus? Do you prefer an urban, suburban, or rural environment? Is there something special you would want in terms of living arrangements or dining facilities? What about special facilities such as computers, laboratories, libraries, or a museum on campus? A summer on a college campus can help you answer such questions about the type of environment in which you want to spend your undergraduate years.

It can be overwhelming to think about all the options for summer. Travel, reading, volunteering ... All are exciting possibilities. All offer opportunities to learn and grow. All can enhance your preparation for college. But a residential summer program can allow you to live and study on a college campus—an experience that will increase your confidence in your ability to navigate the demands of college life.

Postcards from CTY Summer Programs

Students who attend academic summer programs are often asked by their friends why they're choosing to go to "summer school." But the programs described on the following pages are much more than that—they are an invigorating combination of intellectual and social opportunities most students don't often find during the school year.

In the comments below, students who attended the Johns Hopkins University Center for Talented Youth last summer describe the academic stimulation and supportive community they found there.

Alexis Roosa, *Orangeburg, NY*

Most high achievers measure their academic excellence by the grades on their transcripts. Those who attend CTY, however, find that the most important result of their education is not a grade, but knowledge of the world around them. By learning in a challenging and stimulating environment where grades are no longer of concern, students are free to indulge in intellectual pursuits in a way not possible during the school year. This gave me the opportunity to fall in love with the subject matter. I gained a new enthusiasm for knowledge and came to appreciate the value of learning, rather than the value of making the grade.

Kate Waldeck, *Barboursville, WV*

CTY was, and will continue to be, one of the most important experiences of my life. My first class, Writing 1, unlocked a world where students cared. They cared about the subject, they cared about learning, and they cared about each other. Everyone was excited and thirsty for knowledge. Finally I was exposed to an environment that encouraged my desire to learn, a desire almost killed by years of sitting in classrooms where dry facts were pushed at me through dull voices and glazed eyes. All of my instructors at CTY were passionate about their subject matter, and they gave me the chance to move beyond learning the answers to asking the questions.

Over three years I went to four summer sessions of CTY, spending a total of twelve weeks learning writing techniques, cell structures, the monetary system, and inheritance patterns. But most importantly, I gained the realization that there are others like me, and I developed the confidence to succeed. I now know I will spend the rest of my life exercising the curiosity that CTY inspired and the desire to understand and absorb everything around me.

Justin Woo, *South Plainfield, NJ*

CTY is beautiful. In three weeks, every last vestige of normal school is swept away and replaced with instructors who care about what you do, how you do, and most importantly, who you are. There have never been more caring instructors teaching students.

The kids at CTY are the brilliant "talented tenth" of a world saturated with cheap thrills, tabloid television, and shallow, transient pop culture. They aren't afraid of deep thought, art, conflict, or argument, and they don't freak out if someone questions their beliefs. Indeed, some welcome it.

If you live in a place where you think no one is like you, you'll really appreciate CTY. Here, it seems like everyone knows exactly how you feel.

Richard Lease, *Sugarloaf, PA*

The recreational activities at CTY are quite unique! I learned how to juggle and play chess, and even made a duct tape wallet. There were also opportunities for physical training, such as Circuits, which involved sprints, pushups, and the like. Participating in this for a week made me feel confident when I went back home and started getting ready for my fall soccer season.

Weekends also had a lot in store for us. One weekend, JHU was turned into New York, with improvisation and swing dancing at the Apollo Theater, mock investing at Wall Street, and poetry readings at Greenwich Village. Another weekend, it was Casino Night. The highlight of the night was when the RAs dressed up as the Backstreet Boys and the Spice Girls and had a celebrity death match. We also boogied down every weekend at a dance.

The activities at CTY complement the classes extremely well. Every week, I experienced a balance of social, physical, and creative activities.

SELECTED ACADEMIC SUMMER PROGRAMS 2000

Many opportunities exist for you to continue challenging yourself academically during the summer. We have received positive reports from participants about the programs listed below.

Space in many summer programs is limited, so we suggest you apply early. You'll want to inquire about qualification requirements, course options, dates, fees, and scholarship availability. Grades specified refer to students' current grade level.

CTY ACADEMIC SUMMER PROGRAMS

Center for Academic Advancement Grades 7-10, 3 weeks, residential sites in CA, MD, and PA.

Center for Talented Youth Grades 7-10, 3 weeks, residential and commuter sites in CA, MD, NY, and PA.

CTY Young Students Grades 2-6, 3 weeks, commuter sites in the Baltimore-Washington area. Grades 5 & 6, 3 weeks, residential sites in CA, CT, MD, and PA. *CTY Summer Programs, The Johns Hopkins University, Baltimore, MD 21218; (410) 516-0277; www.jhu.edu/~gifted/programs.html*

SDB Learning Center Grades 4-6, 4 weeks, commuter site in CA. *SDB Learning Center, CTY, The Johns Hopkins University, 206 N. Jackson Street, Suite 304, Glendale, CA 91206; (818) 500-9034; www.jhu.edu/~gifted/wcro/index.html#Center*

OTHER REGIONAL TALENT SEARCH PROGRAMS

Center for Talent Development Grades 4-12, 3 weeks, residential and commuter. *CTD, Northwestern University, 617 Dartmouth Place, Evanston, IL 60208; (847) 491-3782, fax (847) 467-4283; ctdnet.acns.nwu.edu/*

Duke University Talent Identification Program (See also Science and Study Abroad.) Grades 7-10, 3 weeks, residential. *Duke University TIP, Box 90747, Durham, NC 27708-0747; (919) 684-3847; www.tip.duke.edu*

Rocky Mountain Summer Institute Ages 11-15, 2 weeks, commuter. Ages 12-16, 3 weeks, residential and commuter. *Rocky Mountain Talent Search, University of Denver, Wesley Hall-Room 203, 2135 East Wesley Avenue, Denver, CO 80208; (303) 871-2983; www.du.edu/education/ces/si.html*

OTHER TALENT SEARCH PROGRAMS

ADVANCE Program for Young Scholars Grades 7-11, 3 weeks, residential. Programs for the Gifted and Talented, *Northwestern State University, P.O. Box 5671, Natchitoches, LA 71497; (800) 259-3173 (within state); (318) 357-4500 (all other areas).*

Academic Talent Search Grades 6-9, 1-5 weeks, commuter. *ATS, California State University-Sacramento, 6000 J Street, Sacramento, CA 95819-6098; (916) 278-7032; edweb.csus.edu/projects/ats*

Accelerated College Entrance Center Grades 9-12, 1-5 weeks, commuter. *ATS, California State University-Sacramento, 6000 J Street, Sacramento, CA 95819-6098; (916) 278-7032; edweb.csus.edu/projects/ats*

Belin-Blank Center Grades 6-8, Junior Scholars Academy; grades 9-11, National Scholars Academy, and Summer Institute for Creative

Engineering and Inventiveness. 1-2 weeks, residential. *Belin-Blank International Center for Gifted Education and Talent Development, The University of Iowa, 210 Lindquist Center, Iowa City, IA 52242; (319) 335-6148 or (800) 336-6463; www.uiowa.edu/~belinctr*

Center for Academic Precocity Grades preK-12, 2-3 weeks, commuter. Grades 7-12, opportunity to participate in 2-3 week residential setting. *CAP, Arizona State University, Box 872711, Tempe, AZ 85287-2711; (480)965-4757; www-cap.ed.asu.edu*

Center for Gifted Studies Grades 7-10, 3 weeks, residential. *The Center for Gifted Studies, The University of Southern Mississippi, Box 8207, Hattiesburg, MS 39406-8207; (601) 266-5236; www-dept.usm.edu/~gifted/*

Office of Precollegiate Programs for Talented and Gifted Grades 6-9, Explorations, 1 week. Grades 7-11, CY-TAG, 3 weeks. Residential and commuter. *OPPTAG, W172 Lagomarcino Hall, Iowa State University, Ames, IA 50011-3180; (515) 294-1772; www.public.iastate.edu/~opptag_info*

Purdue University Gifted Education Resource Institute Grades 7-8: Star; grades 9-12: Pulsar; Avg. 2 weeks. Summer Residential Programs, *Purdue University GERI, 1446 LAEB, Room 5115, West Lafayette, IN 47907-1446; (765) 494-7243; www.soe.purdue.edu/geri*

Southern Methodist University Gifted Institute and Precollege Programs Grades 7-9, TAG program, 3 weeks residential. Grades 10-11, 5 weeks, residential and commuter. *SMU/TAG, P.O. Box 750383, Dallas, TX 75275-0383; (214) 768-5437; www.smu.edu/~gsi/*

Summer Program for Verbally and Mathematically Precocious Youth Grades 7-10, 3 weeks, residential. *VAMPY, The Center for Gifted Studies, Western Kentucky University, One Big Red Way, Bowling Green, KY 42101-3576; (502) 745-6323. Apply by web: www.wku.edu/gifted*

University of Washington Summer Stretch Grades 7-9, 5 weeks, commuter. *Halbert Robinson Center for the Study of Capable Youth, University of Washington, Guthry Annex 2, Box 351630, Seattle, WA 98195-1630; (206) 543-4160; http://departments.washington.edu/cscy/*

Wisconsin Center for Academically Talented Youth Grades 4-6, 1 or 2 weeks, residential. Grades 7-10, 3 weeks, residential. Grades 11-12, 3 weeks, residential. *WCATY, 2909 Landmark Place, Madison, WI 53713; (608) 271-1617; www.tds.net/wcaty/*

HUMANITIES

Concordia Language Villages Ages 7-18, 1-4 weeks, residential. *Concordia Language Villages, 901 South Eighth Street, Moorhead, MN 56562; (218) 299-4544, (800) 247-1044 (within state) or (800) 222-4750 (out of state); www.cord.edu/dept/clv*

Foreign Language Institute, and Writing & Thinking Workshop Grades 9-12, college credit, residential. *Foreign Language Institute, Simon's Rock College of Bard, 84 Alford Road, Great Barrington, MA 01230-9702; (413) 528-7227.*

Interlochen Arts Camp Ages 8-18, 8 weeks, with 4-week option for grades 3-9, residential. *Admissions Office, Interlochen Center for the Arts, P.O. Box 199, Interlochen, MI 49643-0199; (616) 276-7200; www.interlochen.org*

Boston University Tanglewood Institute Ages 14- 18, 2- to 8-week sessions emphasizing music, residential. *Boston University Tanglewood Institute, 855 Commonwealth Avenue, Boston, MA 02215; (617) 353-3386; www.bu.edu/sfa /affiliated/tanglemusic.html*

MATHEMATICS

Canada/USA Mathcamp Ages 13-18, 5 weeks, residential. Rolling admissions. Location varies, year 2000 - University of British Columbia, Vancouver. *Mathcamp, 3560 Pine Grove Avenue, Port Huron, MI 48060; (519) 672-7990; www.mathcamp.org*

Hampshire College Summer Studies in Mathematics Grades 9-11, 6 weeks, residential. Rolling admissions. *HCSSIM, Hampshire College, Box NS Amherst, MA 01002; (413) 559-5375; www.hampshire.edu/~kmdSP/Math.html*

Program in Mathematics for Young Scientists Grades 9-11, 6 weeks, residential. *Applications accepted March 1-June 1. PROMYS, Department of Mathematics, Boston University, 111 Cummington Street, Boston, MA 02215; (617) 353-2563; math.bu.edu/people/promys*

Ross Young Scholars Program** Ages 14-17, 8 weeks, residential. *Ross YSP, The Ohio State University, 100 Mathematics Building, 231 W. 18th Avenue, Columbus, OH 43210; (614) 292-1569; www.math.ohio-state.edu/ross/*

*** NSF-sponsored program. To learn about other subsidized science and math Young Scholars Programs, call the National Science Foundation: (703) 306-1616.*

STUDY ABROAD

CTYI, Dublin Ages 12-16, 3 weeks, residential. *The Irish Centre for Talented Youth, Dublin City University, Dublin 9, Ireland; 353-1-7045634; fax 353-1-7045693.*

Duke TIP International Summer Study Trips Grades 8-11, 3 weeks; England, Germany, and Italy. *Duke University Talent Identification Program, Box 90747, Durham, NC 27708-0747; (919) 684-3847; www.tip.duke.edu*

International Summer Science Institute Grade 12 with independent research experience, 5 weeks, study and travel in Israel. **Deadline:** March 1. *International Summer Science Institute, 130 E 59th St NY, NY 10022; (212) 779-2500; fax (212) 779-3209; www.weizmann.ic.il*

Oxbridge Academic Programs Grades 10-12, 4 weeks, England and France. *Oxbridge Academic Programs, 601 Cathedral Parkway 7R, New York, NY 10025-2186; (800) 828-8349 or (212) 932-3049; www.oxbridgeprograms.com*

SciTech at The Technion - Israel Institute of Technology Grades 10-12, 5 weeks, residential. Open to students of all nationalities and religious affiliations. *The SciTech Coordinator, Center for Pre-University Education, Technion - Israel Institute of Technolog, Haifa, 32000, Israel; 972-4-8293034; fax 972-4-8227433; scitech@tx,technion.ac.il; www.technion.ac.il/~scitech/*

OTHER RESOURCES

Ask about precollege programs at local colleges and universities, and consult these guides:

Educational Opportunity Guide: A Directory of Programs for the Gifted (Updated guide will be available in February 2000) *Duke University Talent Identification Program, P.O. Box 90780 Durham, NC 27708-0780; (919) 683-1400*

Program Opportuniti[illegible]r Academically Talented Students (1996, $10.00) *CTY Office of Public Information, The Johns Hopkins University, 3400 N. Charles Street, Baltimore, MD 21218; (410) 516-0245.*

Summer on Campus: College Experiences for High School Students (1995, $15.00) *Available in bookstores or from Department 340122 College Board Publications, Box 886, New York, NY 10101-0886.*

Summer Opportunities for Kids and Teenagers (1998, $[illegible]

WHY WE KEEP GOING TO ACADEMIC SUMMER PROGRAMS

by Katie and Amy Burghardt

For three summers we attended CTY sessions at Dickinson College in Pennsylvania, taking Crafting the Essay, Writing and the Arts, and Introduction to Psychology. And each fall, we returned to school with another part of ourselves newly awakened. Last spring, when we realized that we had passed CTY's age limit, we pored over catalogues filled with enticing options. But could any other academic program do as much for us as CTY had?

CTY had set some high standards. The teachers were there to teach what they love, and the students were there to find challenges greater than what they found during the school year. And, perhaps most important, CTY had placed us among a group of students as intelligent and curious as we are, which created a unique social situation.

We decided that the only way to find out if such programs existed for older students was to take the plunge. Katie selected the Junior Statesmen Summer School at Yale, and Amy signed up for the Johns Hopkins Precollege Program.

Katie in front of her dorm at Yale.

Katie on Yale

When I told my friends that I was going to study American Government over the summer, some of them asked, "Why would you possibly want to work over the summer?" The funny thing is that until they said that, I never thought of it as work. As in previous summers, I was going away to broaden my knowledge of a subject I love.

Junior Statesmen is a highly focused program. It offers only two courses of study: AP Law or Government, each paired with a speech class, taught in a four-week period. The advantage of a program that has a "specialty" is that there will be a community of people who all share the same interest. We went to class five days a week, from 8:30 to 11:30 and from 1:00 to 4:00, and had tests on Saturday for both classes. In the evening during the week, we held debates in Congressional Workshops on topics like marijuana legalization and drug testing of student athletes. Twice we took trips into New York City, once for a program where we heard from authors, journalists, and government officials, and the second time for sightseeing. We also had several dances on the weekends, and a farewell banquet.

Going to an academic summer program is nothing like going to school, because all 180 of us had chosen to attend. Many of the people I met at JSA feel frustrated by the environment at their school because it isn't intellectual enough. But at JSA, they found the intellectually stimulating peers that they were missing. We all succeeded at Yale, largely because we helped each other. On the night before our first big exam, a group of us gathered for a study group. I don't have that kind of support from my peers at school.

But I'd say that the best aspect of life at Junior Statesmen was the diversity of the people I met. My roommates were from West Virginia and North Carolina, and I had friends from Georgia, Florida, Arizona, and California. Yet a common thread tied us all together: the desire to learn.

Amy at her desk in her JHU dorm.

Amy on JHU

I opted for a program with a broad range of courses, and took comparative religion and cognitive science for six college credits. I was glad I chose to take courses that were very different, because it gave me a knowledge base in two areas and a better idea of where my interests lie. Courses like these aren't taught in most high schools.

I genuinely enjoyed going to class during the five-week program because the teachers were skilled college professors who, like the teachers at CTY, clearly cared about the subjects they were teaching. The professors

Continued on page 34

Selected Summer Programs for Juniors and Seniors

An increasing number of colleges have opened their doors in the summer to high school upperclassmen. Colleges are eager to expose talented high school students to their campuses in the hope that these students will want to enroll as full-time college students. Students "graduating" from the talent search programs can now take advantage of a wide variety of programs aimed at older high school students.

Below is a brief list of some of these programs. If you don't see the college that interests you represented in this list, contact that school directly. Also see **Summer on Campus: College Experiences for High School Students** (College Entrance Examination Board, 1995) *for a variety of summer programs held on college campuses.*

Students applying to these programs should be juniors or seniors in Spring 2000 unless otherwise noted. Please note that many of the programs listed on pages 20-22 are also open to older students.

Brown University Precollege Program
7 weeks, residential. *Office of Summer Studies, Box T, 133 Waterman Street, Providence, RI 02912; (401) 863-7900; cgi-user.brown.edu/Administration/Summer_Studies/ pre/pre.html*

Carnegie Mellon Precollege Program
6 weeks, residential. Open to sophomores and juniors only. *Carnegie Mellon Precollege, 5000 Forbes Avenue, Pittsburgh, PA 15213; (412) 268-2082; www.cmu.edu/enrollment/pre-college/*

Cornell University Summer College
Two 3-week sessions and one 6-week session, residential. *Cornell University Summer College Programs, B20 Day Hall, Ithaca, NY 14853-2801; (607) 255-6203; www.sce.cornell.edu/SC/*

Duke University Precollege Program
6 weeks, residential. *TIP Pre-College Programs, 1121 West Main Street, Suite 100, Durham, NC 27701; (919) 684-3847; www.tip.duke.edu*

Harvard Summer School
8 weeks, residential. *Harvard Summer School, 51 Brattle Street, Cambridge, MA 02138-3722; (617) 495-3192; ssp.dce.harvard.edu/*

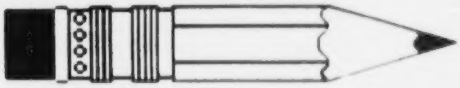
Johns Hopkins University Precollege Program
5 weeks, residential and commuter. Sophomores may also apply. *Johns Hopkins University, Office of Summer Programs, 102 Macaulay Hall, 3400 N. Charles Street, Baltimore, MD 21218; (800) 548-0548; www.jhu.edu/~sumprog/pc-prog.html*

Northwestern University College Preparation Program
6-, 7-, and 8-week sessions, residential. Open to juniors only. *NU Office of Summer Session, 2115 North Campus Drive, Evanston, IL 60208-2650;(800) 346-3768; www.nwu.edu/summernu/programs/cpp/collegeprep.html*

Stanford University Summer College
8 weeks, residential and commuter. *Summer Session, Stanford University, Building 590, 514 Lasuen Mall, Stanford, CA 94305-3005; (650) 723-3109; www.stanford.edu/dept/csss/summer/college/index.html*

Yale University Precollege Summer Program
5 weeks, residential. *Yale Summer and Special Programs, 246 Church Street, Suite 101, New Haven, CT 06510-1722; (203) 432-2430; www.yale.edu/summer/pre_college.html*

MARK YOUR CALENDAR...

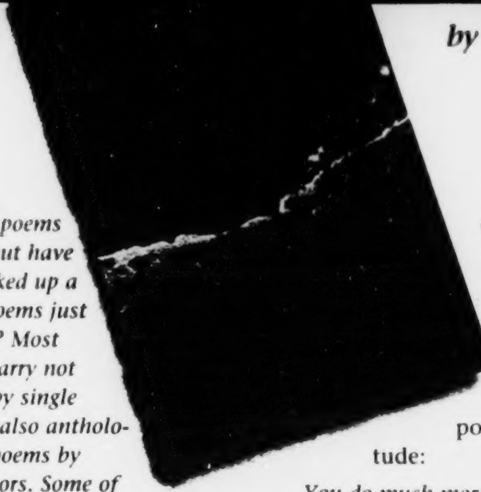


with these February–May deadlines and event dates for selected academic competitions. Inquire about competition format, dates, and fees.

DEADLINE	COMPETITION
February 2	**Toshiba/NSTA ExploraVision Awards Program**—Students register in teams: grades K–3, 4–6, 7–9, 10–12. Toshiba/NSTA ExploraVision Awards, 1840 Wilson Boulevard, Arlington, VA 22201-3000; (800) EXPLOR-9; exploravision@nsta.org; www.toshiba.com/tai/exploravision/main.html
March 1–22	**National French Contest**—French teachers register students in elementary through high school to take this exam offered at seven levels. American Association of Teachers of French, Le Grand Concours, P.O. Box 32030, Sarasota, FL 34278; aatf.utsa.edu/concours
March 15	**Harvard Biological Sciences Olympiad**—Sponsoring teachers register students in grades 9–12. Students first take a 90-minute school-wide selection examination; two students from each school will be selected to take the national exam. Register or request more information by sending e-mail to Ravi Shah, HBSO director, at rshah@fas.harvard.edu
March 29	**Physics Bowl**—Schools register to administer this 45-minute exam to students in grades 9–12. AAPT, One Physics Ellipse, College Park, MD 20740; (301) 209-3344; aapt-prog@aapt.org; www.aapt.org/programs/physbowl.html
March 31	**NASA Ames Research Center Annual Space Settlement Contest**—Individuals through entire classrooms in grades 6–12 develop space settlement designs. Entry forms available online. Al Globus, MS T27A-1, NASA Ames Research Center, Moffett Field, CA 94035; science.nas.nasa.gov/Services/Education/SpaceSettlement/Contest/
April 21	**Knowledge Master Open**—Schools enter one team each for middle, junior high, and high school divisions. Academic Hallmarks, Box 998, Durango, CO 81302; (800) 321-9218 or (970) 247-8738; fax (970) 247-0997; www.greatauk.com
April 1	**Destination ImagiNation (formerly Odyssey of the Mind)**—Teams of students from kindergarten through college register to participate in this creative problem-solving contest. Destination ImagiNation, c/o OM Association Inc., P.O. Box 547, Glassboro, NJ 08028-0547; (856) 881-1603; di99@omhq.org; www.odyssey.org
April 5	**Knowledge Master Open**—Junior, middle, and high schools register teams to participate in computerized test covering 14 curriculum areas that will take place on April 19. Academic Hallmarks, P.O. Box 998, Durango, CO 81301; (800) 321-9218; kmo@greatauk.com; www.greatauk.com
April 12	**USA Computing Olympiad National Championship**—Precollege students participate in three Internet competitions: November, January, and March. Send an e-mail tomajordomo@delos.com to register. Dr. Donald Piele, University of Wisconsin–Parkside, Kenosha, WI 53141; (414)595-2231; piele@cs.uwp.edu; usaco.uwp.edu
May 1	**American Regions Math League (ARML)**—Teams register for national competitions held at Penn State and Universities of Iowa and Nevada; grades 7–12: Mark Saul, ARML President, 711 Amsterdam Avenue, New York, NY 10025; (212) 666-5188; www.armlmath.org
May 18	**National Academic Championship**—High school teams of four register to compete in this general-knowledge contest. Local winners advance to the national level. Reduced fee for registering by May 1. Questions Unlimited, P.O. Box 14798, Columbus, OH 43214; (800) 868-1518; Qunlimited@iwayne.net; www.qunlimited.com

OFF THE SHELF

by Melissa Hartman



You've read poems for school, but have you ever picked up a volume of poems just for pleasure? Most bookstores carry not only books by single authors but also anthologies full of poems by diverse authors. Some of these anthologies resemble college textbooks, but others, like ***Verse & Universe****, treat the reader to a selection of poems on an intriguing theme.*

Subtitled *Poems about Science and Mathematics*, this anthology is composed of eleven sections, each containing poems that address general topics such as "Space," "Matter," "Number," "Human," and "Animal." As you flip through the book's 325 pages, you'll find poems about the moon, the number zero, fossils, neutrinos, the inner ear, Einstein's daughter, fractals, even skeletal decay. If you're like me, you'll have a hard time deciding where to start.

The beginning is a logical place to start but not the only one. You can get a lot out of *Verse & Universe* just by randomly snacking on poems. Although the poems in each section relate to each other and often inform our reading of the other poems (as the poems about fractals in "Number" do), you'll make some important connections across the sections, too.

For example, and perhaps not surprisingly, you'll notice that many poems express praise for and awe of science and math, although in unique ways. Consider "Liver" by Charles Harper Webb. After detailing the many functions of the liver, the poet conveys his gratitude:

You do much more for me every day
than the Mayor. I think I should call
you The Honorable Liver.

You do much more for me than the
Governor. Liver for Governor. Liver
for President. Liver for King.

. . .

Organ of life, playing better than Bach
the toccatas and fugues of good
health and vitality,

Organ whose name contains the
injunction to live, O Liver, O great
One-Who-Lives, so we can too.

Other poems are more subtle in their praise but no less powerful. Often, as in the seven "Essays on Intelligence" by Alison Hawthorne Deming, the science is left to speak for itself. But even in these poems, which describe animal behaviors and seem to leave the poet out altogether, the poet's sense of amazement is apparent. Consider the ending of "Essay on Intelligence: Four," in which Deming describes how the male satin browerbird decorates his nest:

Variant objects displayed in browers: moss, beetle heads, acorns, cellophane, brown stones, blue glass, red leaves, poker chips (like colors stacked), red fruits, blue feathers, black and orange bracket fungi, butterflies.

This is more than a list. It's a look into home whose decorations are beautiful and noteworthy. But Deming doesn't have to say it directly; the objects say it on their own.

However, not all of the poems in *Verse & Universe* praise math and science; many address the concern that knowledge will dispel wonder. In "The Dissolution of the Rainbow," for example, Emily Grusholz explains how Sir Isaac Newton's geometrical analysis of a light passing through a prism destroyed the rainbow. Howard Nemerov's "Figures of Thought" expresses this as a more personal fear. Learning that the same "logarithmic spiral" fits both "seashell and leaf," Nemerov at first is delighted by the patterns mathematics has discovered in nature, but then wonders what math might say about us: "It may diminish some our dry delight/To wonder if everything we are and do/Lies subject to some little law like that..."

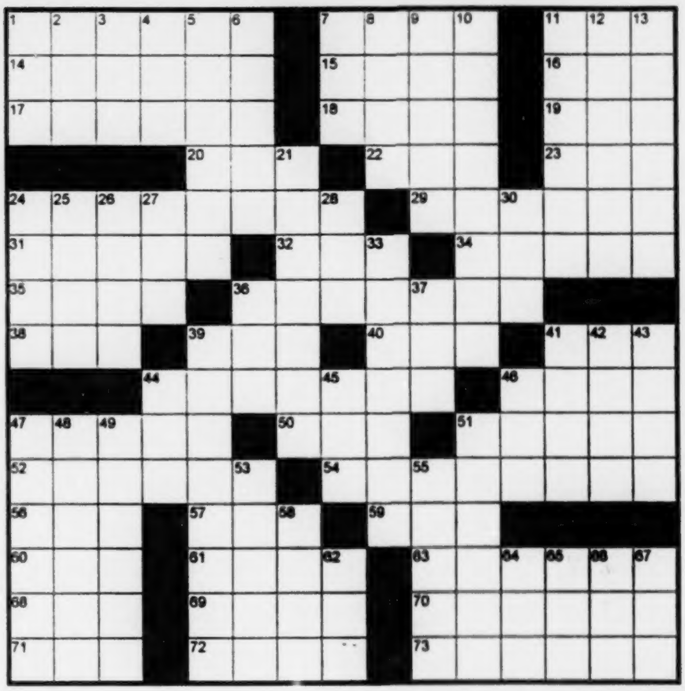
The overall tone of *Verse & Universe* strikes a balance between the extremes. But perhaps what is most important about this anthology is that it brings science and math into the realm of poetry, allowing the two disciplines to illuminate each other. Science and math provide metaphors and creative scenarios for the poems, while the poems provide a form that makes apparent the beauty in scientific and mathematical fact. In the end, science and art don't seem so different.

Upcoming Book Review:

Prometheus Bound by Aeschylus

Ward Wise: Noms de Plume

by Carol Blackburn



ACROSS

1 "The Good Doctor" was one of his many pen names

7 Arm

11 Last word in a French novel

14 Like a cow

15 Operator

16 British spelling of "-ize"

17 Charlotte Bronte's pen name

18 20th century art movement

19 Neither's partner

20 Not Dem or Rep

22 Tease

23 Flightless bird

24 Sci fi author who wrote under both male and female pen names

29 Humiliated

31 April in Paris

32 *ER* network

34 Extreme

35 Authentic

36 Former British intelligence officer David Cornwell's pen name

38 *Jamaica* __

39 Distress call

40 *Blade Runner's* __ Batty

41 Horatio's "Good night, sweet prince ..."

44 Seems

46 Artists Assn of New England (abbr.)

47 Class

50 Non-recording option (abbr.)

51 *Playboy of the Western World* author

52 Eric Blair's pen name

54 *The* __, fishy title of a book by the winner of the 1999 Nobel Prize for Literature

56 Compass point

57 Silent movie actor Chaney

59 Friendly dog

60 __ Serling

61 A brother Karamazov

63 Cold sleep

68 Beverage

69 A creation of 6 Down

70 Thomas Stearns and George

71 Dentist

72 Matured

73 With 24 Down, a creation of 1 Across

DOWN

1 The beginning

2 French penny

3 Interactive voice response (abbr.)

4 Russian space station

5 *The Iceman Cometh* playwright

6 Jules __

7 Leader of 18th century anti-technology riot

8 With 21 Down, Karen Blixen's pen name

9 Communications

10 This sci fi author's pen names include D. Lerium Tremaine

11 Best

12 From the Greek for "equal parts"

13 Chilean poet Pablo __

21 See 8 Down

24 Mata __

25 Level

26 Persia

27 Nada

28 *3rd Rock* network

30 Homonym of 64 Down

33 Rev. Charles Lutwidge Dodgson's pen name

36 __ off (decapitate)

37 Rosalyn, to her friends

39 Tori __

41 See 46 Down

42 *Picnic* playwright

43 __ Gynt

44 Consumed

45 Bowwow

46 With 41 Down, Alisa Rosenbaum's pen name

47 Josef Teodor Konrad Korzeniowski's pen name

48 "...Where ignorant armies clash by night" poet

49 August Strindberg and Carl Linnaeus

51 Delicate

53 Archetypal character

55 Watering holes

58 "What's in a __?"

62 Pronto

64 Suffer

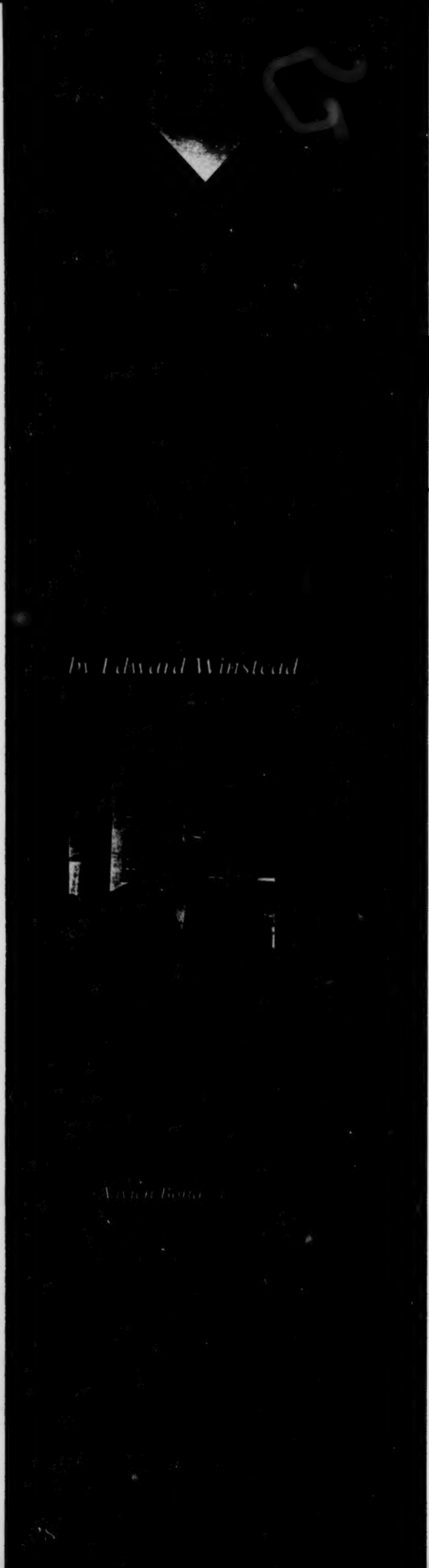
65 Peat

66 OJ's judge

67 ID no.

Solution on page [illegible]4

Options:
matics



by Edward Winstead

Vivien Bona

Vivien Bonazzi nearly got tossed out of her Ph.D. program for spending too much time in the physics department's computer lab. She was a molecular biologist, not a physicist. But to her, computers were just another tool for doing biology. Today, "bioinformatics"—a melding of biology and information systems—is a hot field in science. Bonazzi, a 35-year-old Aussie, directs "Gene Discovery" at Celera Genomics, a biotechnology company in Rockville, Maryland. Celera is attempting to decipher the entire human genetic code, or genome, using machines that automatically sequence DNA. Bonazzi's team uses bioinformatics tools to search the data for genes that could lead to new treatments for disorders like cancer and heart disease.

Tell us about your work at Celera Genomics. First, what is genomics?

Genomics involves looking at the entire DNA of an organism, from bacteria right on up to humans. In the past, people have been able to study only a small number of genes—a fraction of the genome, whatever the species. This approach was the equivalent of looking at a magnificently detailed room through a peephole in the door. Then, a few years ago, scientists used new technologies to sequence the complete genome of a bacterium. By sequencing, I mean they figured out the order of DNA's four chemical units, the "letters" that make up genes. So now, for the first time, they had the blueprint—all the genetic information—of an organism.

What will it mean to "have" the biological blueprint of humans?

We are a collection of genes, and every gene is important. If we can see how they all fit together, patterns will emerge and we'll learn about gene function. This will lead to new drugs and therapies, which is why people say genomics will be the basis of medicine in the next century. To use an automobile analogy: if you're missing a piston, the engine's not going to work and the car won't move. But if you have the blueprint of a car and understand the piston's role in making the car go, you probably can correct the problem.

> We are a collection of genes, and every gene is important. If we can see how they all fit together, patterns will emerge and we'll learn about gene function.

DNA is now decoded, or sequenced, by powerful machines like these DNA analyzers at Celera. The analyzer's robot arm has eliminated tedious steps once done by lab technicians, and each machine can analyze nearly a hundred DNA samples simultaneously (compared to one sample at a time the old way). The result: in one month last fall, Celera sequenced roughly the same amount of human DNA that had been sequenced in the last ten years—about one billion units.

What kinds of genes are you looking for?

Right now we are looking for genes that are related to a set of "target" genes. These target genes have already been discovered, and we know something about what they do. They could be involved in disorders like cardiovascular disease, cancers, or neurological disease. We think that the genes in our target set have many close relatives, and we're trying to find them.

How do you look for a gene?

A typical gene might be 1,000 to 2,000 letters long. The sequencing machines decode fragments that are usually about 500 letters long, so we are getting sequences that could be part of a gene, but not an entire gene. Here in Rockville we do computational analysis with software that spots patterns in the DNA data. In a nutshell, we run the DNA sequence through our system, which is an analysis pipeline. At the end of the day, the question is: How similar is the unknown sequence to the known genes that we consider important?

What happens when you get a match?

Once we find an interesting sequence, we send it to our colleagues on the West Coast. We're just theorists; they've got the laboratories and the tools to gather physical evidence to prove the theory. Let's say we've got a DNA sequence that is related but not identical to a known gene—what we call a "hit" to a really hot target. Then we send the West Coast group our computational evidence linking that fragment to some function. They use their molecular biology tools to find the complete gene sequence and prove the theory. If, based on our computational analysis, this fragment proves to be a member of the postulated family, then we're cool.

Once the human genome is sequenced, are you out of a job?

No. The sequencing is just the beginning—it's the information gathering. You have to turn that information into knowledge. And to do that, you need people who know something about both biology and information systems—a hybrid scientist known as a bioinformaticist. Bioinformatics research will continue, I hope, long after I retire.

How did you get started in this?

During my Ph.D. at the University of Melbourne, I was looking at several proteins that were very similar. I wondered if computer methods could be used to identify differences and similarities in the gene sequences of these proteins. DNA is just a string of characters—like a string of text. I thought, if it's a string of text, then surely I can compare an unknown string to a known string—and a computer would do that better than I. So if I tell a computer, for instance, to flag a string of characters every time it occurs, then I've written a mini-program that tells me something about my sequence.

Are you a programmer, then?

I'm not a programmer. But to manipulate data, I have to know the capacity of the programs. And these were not shrink-wrapped, point-and-click programs from off the shelf. The underlying operating systems used command-driven language, so I learned UNIX. People with mathematical skills who were interested in the guts of the programs got into algorithm design. People like me, who simply wanted to manipulate the results from a biological perspective, were users and knew what the programs did.

Were other people in your Ph.D. program using computer models?

No one in our department knew anything about computers. But I had friends in the physics department who used huge computing systems all the time to do analysis. They taught me a lot—I spent about three of the six years of my Ph.D. in their computer lab. In fact, at one point I thought I would become a physicist.

Did bioinformatics exist elsewhere at the time?

Yes. Early on, I said to myself, if I've thought of this, then I bet someone else has thought of this. Indeed, people had, so I started downloading programs. By the late 1980s, there were plenty of programs out there, but this was before the World Wide Web, so you had to know some UNIX.

Was it hard to alter your career path?

It was hard at first. I had no idea how to blend informatics with biology, and I felt stuck in no-man's land: computer scientists would laugh at me, and biologists gave me flack. My professor, who arrived after I'd begun the program, said, "If you had started your Ph.D. after I arrived, you would never have been allowed to do it in this department." He obviously meant that I was spending too much time on the computer. I just smiled.

Is it a hard field for young people to enter today?

It's much easier today. Bioinformatics is much better understood and well known by everyone from the computer scientists on the algorithm side to the biologists on the analysis side. Every molecular biologist today will know about certain bioinformatics programs. Once, there were few DNA sequences and little need for bioinformatics. But now, of course, lots of DNA has been sequenced, and there is a good data pool, which is what scientists want.

Will people with bioinformatics skills have job opportunities in the coming years?

The job market for those skills is very good right now, and genomics is in the news all the time. There will be lots of opportunities for people with bioinformatics skills at pharmaceutical, agricultural, and biotechnology companies. I suspect there will be a growing number of bioinformatics research positions in academia as well. At the moment, bioinformatics people get paid better than most scientists, but that will probably change over time.

As director of Gene Discovery, what type of person do you want to hire?

People like me knew nothing about information systems, and we had to learn it all. You're either wired with that kind of curiosity or you're not, and that comes across in a job interview. Some people say, "I want manipulate text strings," and "so-and-so's program is really cool because you can look at the biology this way." When I get a person like that, I know they'll fit in with our group. This job is not about knowing everything, because you can't know everything. What you have to know is how biology and computing systems mesh so that you can ask the right questions to get the right answers.

Edward Winstead was assistant editor of Imagine *in 1998. He is a reporter for* geneweek, *an Internet magazine published by Celera Genomics that will go online this year.*

THE COACH'S CORNER

ARML from the Problem-Writer's Perspective

by Don Barry

ARML is an exciting annual competition that takes place simultaneously at Penn State, University of Iowa, and University of Nevada—Las Vegas. Teams representing states, counties, cities, and individual high schools compete in four rounds that challenge them as teams and as individuals. For more information about ARML, call (212) 666-5188 or visit the Web site at www.armlmath.org.

The ARML problem writers include IMO participants, high school teachers, college professors, and graduate students. We try to write problems in geometry, algebra, number theory, analytic geometry, and pre-calculus that intrigue, challenge, and delight connoisseurs of the non-mechanical math problem. In this column, I'll take you through a few such problems.

A quintessential ARML problem seems outrageously impossible, yet yields to an accessible insight. Consider this example: **Determine the numerical value of $199919981997^2 - 2 \bullet 199919981994^2 + 199919981991^2$.** Students groaned when they saw this problem, no doubt wishing for a calculator, but in the end, most of them saw the underlying algebraic pattern, that $(p+3)^2 - 2p^2 + (p-3)^2 = 18$. Interestingly, many calculators do not give the correct result!

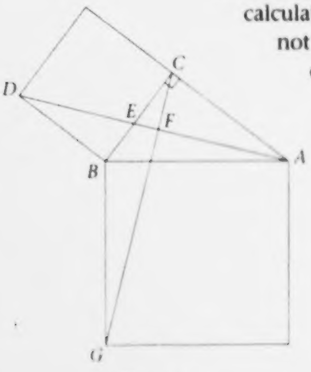


Figure 1

We don't just pull our problems off the shelf—many of them result from a considerable amount of exploration and research. While studying Euclid's first proof of the Pythagorean Theorem in Figure 1, I discovered that the difference in areas between ΔBDE and ΔCEF was equal to the square of the altitude from B to $\overline{DE}$.

That led to this problem: **If $BC = 68$ and $AC = 204$, determine the difference in areas between ΔBDE and ΔCEF.** One solution uses the congruence of ΔDBA and ΔCBG to obtain the similarity of ΔCFE and ΔACE. This leads to the lengths necessary to calculate the areas. Another solution finds sides and areas in terms of trig. My little theorem isn't necessary for the problem's solution, but it is a generalization that gives the problem depth and substance.

ARML consists of four rounds: Individual, Team, Power Question, and Relay. In each round, the first problems can be solved by most of the participants, but the last problems require considerable insight and depth of understanding. Consider the first problem from the 1998 Individual Round, an interesting twist on a magic square problem: **In Figure 2, numbers are to be placed in the five remaining squares so that the sum of the elements of each row and of each column are equal. Determine the value of $X + Y - Z$.** Setting $1 + Y + 9$ equal to $9 + Z + 8$ gives $Y - Z = 7$. Other equations give $X = 8$. What is interesting here is that although one cannot determine unique values for Y and Z, their difference is invariant. This is typical of an ARML problem: We try to think up problems with multiple solutions; we look for problems with surprising invariance.

1	Y	9
9	X	Z
		8

Figure 2

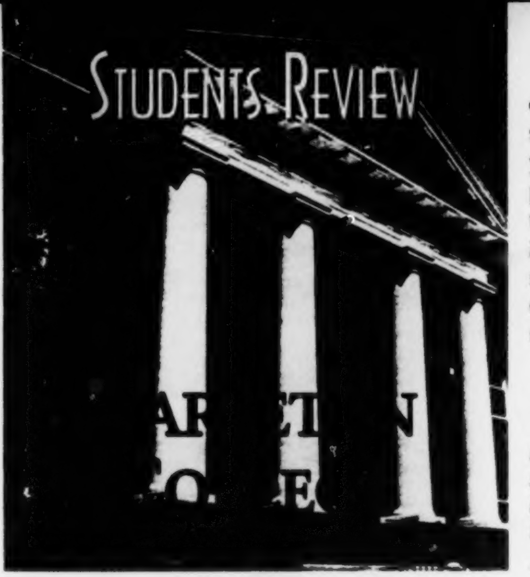
We also develop problems requiring a breadth and depth of knowledge. Consider the last problem from the 1997 Team Round: ***ABCD* is a regular pyramid whose edges have length 5. Consider the set of pyramids *AMNP* where M lies on $\overline{AB}$, N lies on $\overline{AC}$, and P lies on $\overline{AD}$, such that *AM*, *AN*, and *AP* $\in \{1, 2, 3, 4\}$. Determine the sum of the volumes of all such pyramids.** This problem is solvable if one is creative enough to think of using a unit pyramid or advanced enough to make use of 3 by 3 determinants.

There isn't space in this column to discuss the Power Question Round in depth. In brief, it consists of a series of related questions that lead from concrete problems designed to help the students understand the problem to a general result that is interesting and significant. Some problems require numeric answers; some require proofs. Teams have 60 minutes to complete the round. Over the years, Power Questions have developed some very interesting mathematics involving putting bananas into piles, arranging integers on a number line, covering polyhedra with pyramids, and judging figure skaters. The most difficult parts of most Power Questions have called for proof by mathematical induction. This has occurred because the inductive step is remarkably useful and far more powerful than its lackluster treatment in high school mathematics would indicate.

Our goal is to create a team-oriented, emotionally exciting math contest. We want all students to have some success; we hope that if they miss a problem, they'll know that if only they'd seen "this one thing," they could have solved the problem. We want them to have the opportunity to discover their own creativity in a face-to-face encounter with some real mathematics.

***Don Barry** is chair of the problem writing committee for the American Regions Mathematics League (ARML). He teaches mathematics at Phillips Academy in Andover, MA, where he also coaches cross country and basketball and is advisor to the Model UN club.*

The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.



Our reviewers include 13 students, who major(ed) in anthropology/sociology (1), art (1), biology (1), computer science (1), East Asian studies (1), economics (1), English (2), German (1), Latin American studies (1), math (4), and psychology (1). (The number of majors exceeds 13 because two students had double majors.) Students' comments appear within quotation marks.

Quality of Academic Instruction for Undergraduates

One of the country's top small liberal arts colleges, Carleton offers an intimate learning environment, professors who want to teach undergraduates, and eager fellow students.

"Professors are not only well-informed; they are talented teachers who care about us as students and people. From talking with friends at large institutions, I realize what a gift that was. I was on a first-name basis with most of my professors and felt fully comfortable coming to their offices. In class, we weren't force-fed knowledge; students and faculty were engaged in a dialogue even in highly structured disciplines like mathematics. I was encouraged to follow my interests in independent research and even to tackle open problems. Professors were always willing to give extra help and advice—even in classes they didn't teach. Several professors were very lavish with their time and support and helped me immensely."

"Classes are comfortably small; median class size for me has been about 25. Carleton has no core curriculum, but has a set of distribution requirements or 'distros,' which include three courses in math/science, three in social science, two in literature and art, two in humanities, and one in Recognizing and Affirming Difference. Four phys ed courses are also required. Distros can be fulfilled by courses from a number of different departments and at a number of difficulty levels, so it's fairly easy to find something that interests you. The system leaves a lot of room for choice and discovery, but ensures that Carleton students receive a true liberal arts education."

"Distros are reasonable and force you to take classes that you might otherwise never have considered: Macroeconomics, which I dreaded, turned out to be fascinating; and New Religious Movements in America, which I took merely to fulfill my last Humanities requirement, was an amazing experience, bringing me in touch with people and groups labeled by mainstream society as freaks and cults."

"Carleton courses are rarely survey courses designed to pack in as much information as possible. Instead, the goal is to make you think in-depth about the issues behind the facts, an approach whose results will stay with you long after you've forgotten the details. Classes and profs are demanding (you work hard for every credit here), but the school's laid-back, cooperative atmosphere makes up for it. Peers are very willing to help in the learning process, and free tutoring is available in all subjects for the struggling (or just nervous) student."

"The trimester system (three terms, with three courses per term) allows you to concentrate on three subjects at one time. Most students love it; they'd rather work hard on three courses than try to juggle five or six courses as students at most colleges do. We also have a six-week break, from Thanksgiving through New Year, which makes it possible to spend the fall semester abroad and miss only one trimester."

"There are many opportunities for off-campus study, and 65% of students study somewhere else during their years at Carleton. I participated in one program led by a Carleton professor to study biology in Australia and New Zealand, and next winter break will spend two weeks on a different Carleton program doing research on the rainforest in Costa Rica."

Social Life

Like most small liberal arts colleges in small towns, the social life is campus-based and creates a strong sense of community.

"I have met my soulmates at Carleton—the people I'll be close to for the rest of my life. The students here are great: open, intelligent, and easy going. 'Rumpled and fun-loving' is what one college book said. Corny, but true. Carleton is located in small-town Minnesota, which is, yes, just like Garrison Keillor says. Northfield has a cheap movie theater, a bowling alley, and a few restaurants, but otherwise offers few social options. Minneapolis is only 40 miles away and has pretty much anything you could want, but most students don't leave campus that often. There's such a vibrant life on campus that it's hard to find the time or the inclination to leave."

"Most Carleton students live on campus, where everything is within walking or biking distance. Students are discouraged from having cars on campus, and Northfield offers little in the way of entertainment, so students are forced to bring their fun home. The result is a thriving social life right on your doorstep, with something for everyone: pulsating keg parties, classical music recitals, rowdy sports teams, a coffeehouse where intellectuals sip coffee and discuss Marx, and the constant interaction of active minds. It's a very safe and fun environment. People don't judge each other, and no one is afraid to be silly or loud or to really express themselves. The people I've met here have challenged, entertained, provoked, and comforted me."

"In the winter, when it's frigid (with wind chills of -30°F), most socialization occurs in the dorms, so your living situation is often the center of your social life. Most floors have a great social life, but it was also very easy to expand my horizons and meet people outside my immediate environment. Special-interest houses exist for linguists, women, outing club members, Hispanics, African-Americans, etc. There are no frats or sororities, and I've never met a Carl who was unhappy about this. There is a lot of drinking and some casual drug use, but I never felt pressured to drink or use drugs. Everyone is accepting of those who choose to abstain. A substance-free floor is also available for those who want to avoid smoke and alcohol."

"Trust me when I say that there are way too many clubs to list. Carleton has organizations for just about any interest: religious groups, from the Carleton Christian Fellowship to the Druids; publications; social action groups, like Habitat for Humanity and Amnesty International; cultural groups; environmental groups; and countless other organizations. Almost everyone is involved in at least one activity and most people in several."

"Intramural sports are super popular, in traditional sports as well as more wacky ones (Carleton helped pioneer the popularity of Ultimate Frisbee). In the winter, broomball on ice is huge, and in the spring, the rage is Rottblatt, a unique version of softball."

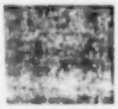
What Do You Like Least about Carleton?

The openness and supportiveness of the Carleton community were repeatedly mentioned.

"Carleton gave me the chance to explore my options on so many different levels. It is an open environment in which it is easy to make friends, explore any academic field, and express yourself. I have been thoroughly satisfied with just about every aspect of Carleton."

"I love the smallness of Carleton and the town of Northfield. It's easy to get to know people and to get involved. When I set out to join the fencing club, I had never fenced; but they were willing to teach me and let me participate with the rest of the club. Don't get me wrong—there is a lot of talent at Carleton, but you don't have to be a superstar to be involved."

What Do You Like Best about Carleton?



Most reviewers mentioned the limited racial and ethnic diversity in response to this question.

"Carleton is not terribly diverse, although it's trying. Other kinds of diversity exist here—a range of socioeconomic backgrounds, geographical origins, beliefs, sexual orientations, interests—but I feel that the lack of substantial racial diversity is problematic. There is also a bit too much political correctness for honest discussions of sensitive issues to occur."

"Minnesota winters are *cold*, and as much fun as I've had building snow forts, having snowball fights, and drinking hot cocoa, I don't enjoy walking back from the library with a cold wind running through my coat. It puts a damper on winter term. Come spring term, though, the Lyman Lakes melt and the cheerfulness comes out of the woodwork. And not a moment too soon."

CARLETON COLLEGE

Northfield, MN 55057
800-995-2275

- 4-year private coed liberal arts college
- Campus in a small town in rural Minnesota
- Full-time undergraduate enrollment 1999-2000: 905 men; 963 women.
- Special features: 950 acre campus with a 400 acre arboretum.

"Carleton could have done a better job at helping me make the transition from academia to the working environment, which is so very different. Interacting with people who are all bright, intellectually curious, and open-minded does not prepare you for the real world!"

Who Would Be Most Compatible with the Academic and Social Atmosphere at Carleton?

"Your optimal Carl would be someone who is easy-going, funny, and inquisitive, and who manages time well. If you don't, you'll fall behind; and catching up in a ten-week term is tough."

"Any student with an open mind who is not wedded to the bright lights of a big city would have a great time at Carleton. If you need a cavernous dance club to have a good time, or need to see a cyclotron to learn particle physics and want to listen to the world's leading authority explain it in accented English, then the limited facilities of a small school will hold you back."

"While the majority of students at Carleton are politically liberal, I think students of all political leanings can be happy here. From my experiences, the only students who are chastised for their views are those who are closed-minded and unwilling to discuss ideas intelligently and with patience for opposing viewpoints."

If You Had It to Do over Again, Would You Go to Carleton?

All reviewers enthusiastically said yes.

"You bet! I have yet to hear from a high school friend who has been as happy with their college choice as I have. Carleton provides a supportive, friendly, laid-back atmosphere in which it has been comfortable for me to live and learn. If only it weren't so darn cold!"

"Definitely. I chose Carleton by the smallest of margins over Williams (a similar school in many ways) and have not been disappointed. I love the smallness of the college, the small town setting, and the intensity of the trimester system."

"Yes! Carleton has allowed me to be comfortable in my own skin. I am not afraid to say or do anything here. I feel respected, and I respect and appreciate others. People are serious about academics, but they don't take themselves too seriously. I think that sets Carleton apart from many comparable small liberal arts schools."

As you try to find the college or university best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or CTY.

Detroit Free Press—from page 13

seemed so dull, and I couldn't imagine how I would fill the 15" space that had been budgeted for it. But I decided to take advantage of the two-week deadline and began forming regular contacts with sources from both sides of the dispute. As time went on, they became more comfortable talking to me, and I began to receive information so candid it wasn't printable. I became engrossed in the issue, and, ironically, this story became one of my favorites of the summer. I ended up exceeding the 15" budget that I thought I wouldn't even meet.

As turbulent as my summer at the *Detroit Free Press* may sound, I can't imagine a more worthwhile way to have spent those three months. The people I met and the experiences I lived through introduced me to the real world of journalism. It didn't take long for me to discover that being a journalist isn't always about meeting interesting people, exposing the dirtiest scandals of the decade, and covering the biggest issues of the century. As an intern, chances are that you won't be asked to cover the death of a celebrity or the upcoming national election. Instead, your headlines will be "River Navigator Has New Ideas" and "Little City to Get European-Style Roundabout." But it is these stories that will test your ability as a journalist. No matter how dull a story may seem, there is always someone who thinks it has a world of importance, and you'll quickly discover that there's a lot more going on in your little town than you ever knew.

***Simone Sebastian** is a freshman at Columbia University and is considering a major in political science. A reporter for the university newspaper, she is running for the position of associate editor of the Perspectives section. Simone is also a member of **Teen People** magazine's 1999-2000 news team.*

Why We Keep Going— from page 24

expected us to be responsible for ourselves and do the assigned homework. Most of the time, unless it was written work, they didn't check up on it; it was up to me to do the readings so that I would understand the material for the tests.

Yes, the tests. But those had benefits, too, because they showed me that I had mastered the material and could perform as well as college juniors and seniors. If you put effort into the work, you're going to earn good grades. And when you see the "A" marked on your midterm, you know that you really earned it. The feeling of pride that came from doing well in a real college course gave me confidence as I look ahead to college.

I went to class three days a week from 8:30 to 11:00, and 12:00 to 2:30. The rest of the time, I was on my own with some suggested activities to choose from. I really had to learn to structure my time to accommodate my study schedule, sleep, and my social life. The social aspect the program was particularly rewarding—I was surrounded by 300 other kids with similar interests and abilities, which reminded me that there is intelligent life out there! We bonded outside of class, sitting around arguing about philosophy, playing frisbee, sightseeing in Baltimore and Washington, D.C., and going to dances and concerts together.

When we came home, we had a lot to talk about. We had never been apart for longer than a weekend, and here six weeks had gone by. We attended such different programs, yet in important ways our experiences were remarkably similar: we both felt strong support for our dedication to academics, found deep stimulation from the intellectual immersion, and began to carve the road leading to our life's work. Will we attend academic programs again next summer? Yes! They not only reflect who we are but push us gently toward who we will become.

***Amy and Katie Burghardt**, 17-year-old identical twins, are juniors at Great Neck South High School on Long Island, NY. They are both editors of the school newspaper and junior-varsity debaters. Amy is a peer drug educator and Latin editor of the foreign language magazine, and Katie is president of the Environmental Club and a leader on the Mock Trial Team.*

For more information about Junior Statesmen of America Summer Programs: The Junior State of America, 60 East Third Avenue, Suite 320, San Mateo, CA 94401-4032; (800) 334-5353; www.jsa.org

***For more information about JHU Precollege Program**, see list on page 24.*

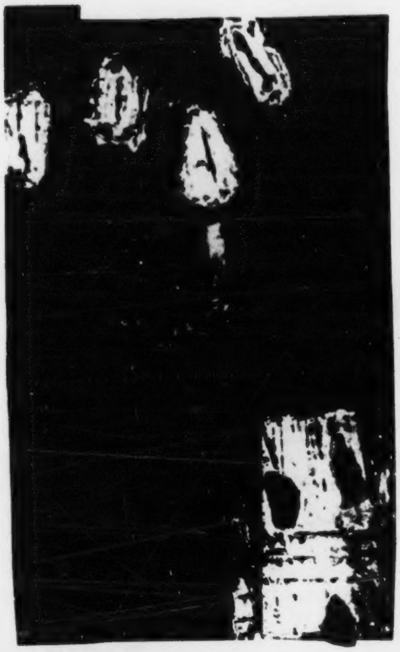
More About... Two Georges

Eric Blair chose the pen name "George" (Orwell, 52 Across) for Saint George the dragon slayer, someone who, like Orwell, went after big game. Mary Ann Evans chose the pen name "George" (Eliot, 70 Across) to honor her significant other, George Henry Lewes.

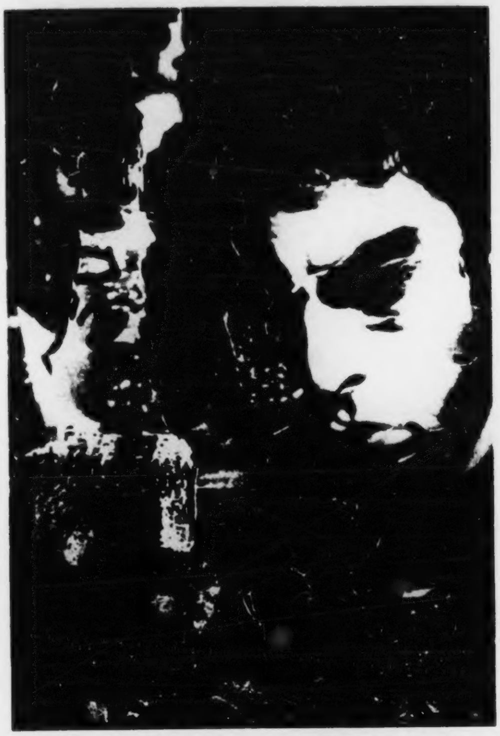
A	S	I	M	O	V	■	L	I	M	B	■	F	I	N
B	O	V	I	N	E	■	U	S	E	R	■	I	S	E
C	U	R	R	E	R	■	D	A	D	A	■	N	O	R
■	■	■	■	I	N	D	■	K	I	D	■	E	M	U
H	E	I	N	L	E	I	N	■	A	B	A	S	E	D
A	V	R	I	L	■	N	B	C	■	U	L	T	R	A
R	E	A	L	■	L	E	C	A	R	R	E	■	■	■
I	N	N	■	S	O	S	■	R	O	Y	■	R	I	P
■	■	■	A	P	P	E	A	R	S	■	A	A	N	E
C	A	S	T	E	■	N	R	O	■	S	Y	N	G	E
O	R	W	E	L	L	■	F	L	O	U	N	D	E	R
N	N	E	■	L	O	N	■	L	A	B	■	■	■	■
R	O	D	■	I	V	A	N	■	S	T	A	S	I	S
A	L	E	■	N	E	M	O	■	E	L	I	O	T	S
D	D	S	■	G	R	E	W	■	S	E	L	D	O	N

Creative Minds Imagine

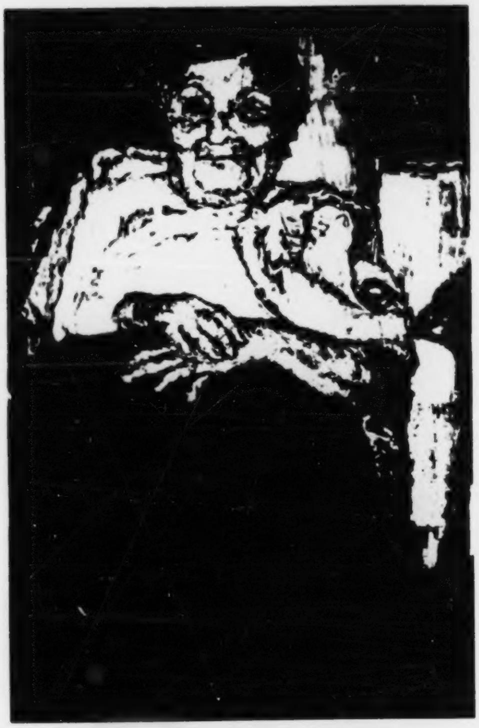
All of the art on this page was created by students in the **Visual Arts Program**, a two-year program for high school juniors and seniors at North Carolina School of the Arts. NCSA also offers a five-week Summer Session in Visual Arts as well as in other disciplines. For more information: *North Carolina School of the Arts, 1533 S. Main Street, Winston-Salem, NC 27127-2188; (336) 770-3290; www.ncarts.edu*



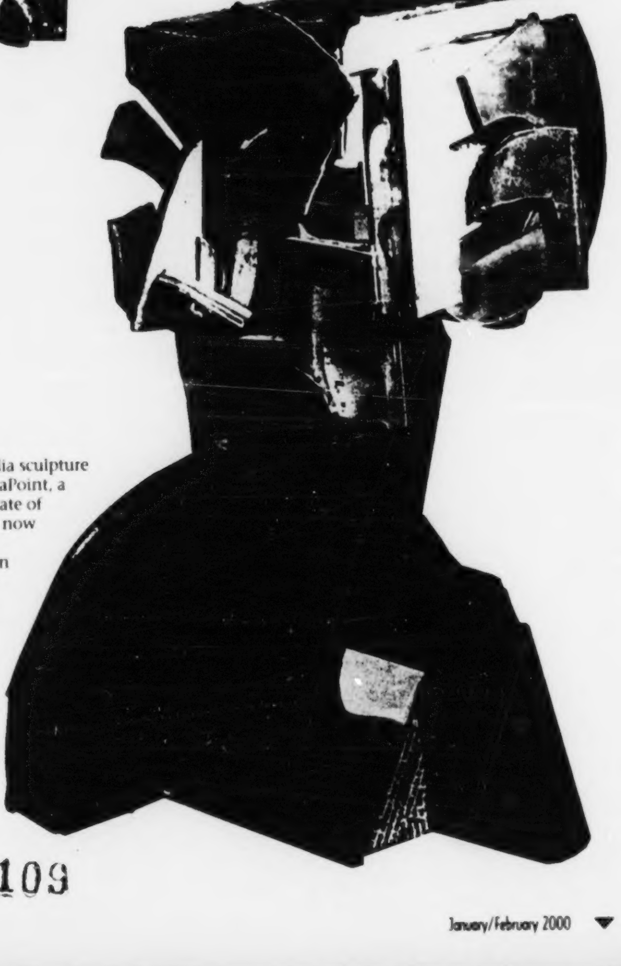
Mixed-media painting by Austin Lynch, a high school senior from Charlottesville, VA.



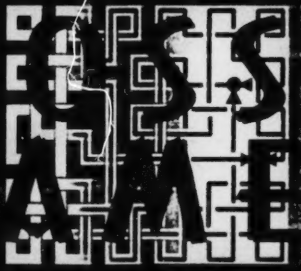
Mixed-media collage by Ketan Mody of Titusville, FL, who entered the Visual Arts program in the 12th grade and is now a college freshman.



Painting by Ivan Liotchev, a high school senior from Durham, NC.



Mixed-media sculpture by Kelsey LaPoint, a 1998 graduate of NCSA who now attends Washington University in St. Louis.



By Tim Boester

Farmer Tim has been planting the same nine vegetables in a three-plot-by-three-plot square garden for the past few years. When he went to prepare a layout for this year's planting, he discovered that he had lost the layouts for the last two years. It is vital that he reconstruct the layouts because all crops must be "rotated" so that a given crop does not occupy the same plot of land in consecutive years. After a long search, he was able to track down some empty seed packets with some scrawled notes about where crops had been planted each year. Can you help reconstruct the missing layouts?

Note: Notations like "just north of" or "right next to" indicate contiguous crop plots—ones that share a common border.

Two Summers Ago

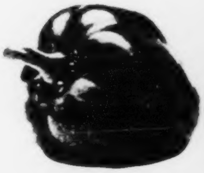
Seed packet notes:

- The green peppers were just north of the yellow corn and just west of the tomatoes.
- The red peppers were just north of the lettuce and just west of the green beans.
- The lettuce was right next to the broccoli.

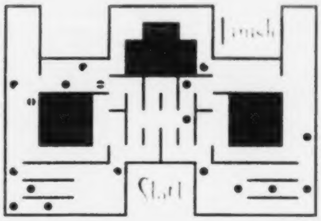
Last Summer

Seed packet notes:

- The yellow beans were just north of the red peppers and just east of the tomatoes.
- The green peppers were just south of the lettuce and just west of the carrots.
- The green beans were just north of the yellow corn.



A graduate student in educational psychology at the University of Wisconsin, ***Tim Boester*** *now has additional puzzles on his home page: www.math.wisc.edu/~boester*



Solution to Knossos Game in our November/December issue

BEST COPY AVAILABLE

Published by the Johns Hopkins University Center for Talented Youth

Imagine...

OPPORTUNITIES AND RESOURCES FOR ACADEMICALLY TALENTED YOUTH

March/April 2000

Focus on Computer Technology

The Making of eBiz4Teens

Reflections of a Homeschooler

Students Review Georgetown University

BEST COPY AVAILABLE

TABLE of C▸O▸N▸T

Features

4 Computer Technology: Reshaping Our Lives

eCommerce, IT, .com: Computer technology has given us not only a whole new vocabulary but also a vast range of opportunities. Here's a glimpse at what these opportunities mean for you and your future.

6 The Making of eBiz4Teens

Teen entrepreneur Melissa Sconyers saw the ThinkQuest competition as an opportunity—to help other teens succeed in the world of eBusiness.

8 Caught in the 'Net

Visiting the Web site of a favorite role playing game inspired Ilja Ryzhov to create an ever bigger, better site ... and his experience taught him a lot more than HTML.

9 Unexpected Success on the Web

All Tao Yue set out to do was perform unit conversions without using valuable lab time. But his efforts turned into a highly successful shareware program, and Tao is still reaping the rewards.

10 Get with the Program: The USA Computing Olympiad

A two-time participant in the International Olympiad in Informatics, Benjamin Mathews explains why potential programmers should hone their skills in competition.

12 Short Circuit: Why Computers of the Future May Be Organic

How will computers continue to become faster if their circuits and switches can't become any smaller? 1999 ISTS finalist David Moore explains why the answer may lie in organic molecules.

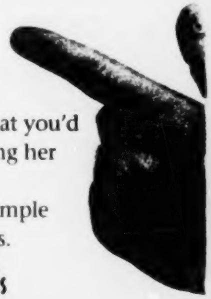
14 The Science of Language: Computational Linguistics

When he was in sixth grade, Jason Eisner wanted to teach his computer to converse with him. Now an assistant professor of computer science, he's still working on that project.

16 Exciting Developments

Addicted to code? A software developer and a developer support engineer discuss career possibilities for those who love programming.

18 Computer Technology Resources



21 Look, Ma, No Hands: Living with Repetitive Stress Injury

What if using the computer meant that you'd one day lose use of your hands? During her freshman year at Harvard, Vasugi Ganeshananthan learned that even simple typing can have painful consequences.

22 Where the Classrooms Have No Walls

Molly Richman has been homeschooled her entire life. Now a 15-year-old junior, she reflects on the education she received.

Departments

24 Off the Shelf
Review of *Prometheus Bound* by Aeschylus
25 Word Wise
26 Exploring Career Options
Interview with Heather Ivy, FBI Special Agent
30 Planning Ahead for College
Accessing college information on the Internet
32 Students Review Georgetown University
34 The Coach's Corner
35 Creative Minds Imagine
Essay by Lisa Chan
36 Knossos Games

BEST COPY AVAILABLE

ImaGiNe...

*Opportunities and Resources for Academically Talented Youth**

ISSN 1071-605X
Volume 7 • Number 4
March/April 2000

Copyright © 2000 by The Johns Hopkins University.

*A trademark of The Johns Hopkins University.

All rights reserved. No portion of this journal may be reproduced by any process or technique without the formal consent of the Johns Hopkins University Center for Talented Youth.

JOHNS HOPKINS
UNIVERSITY

Center for Talented Youth

Published five times a year—September/October, November/December, January/February, March/April, and May/June.

Periodicals Postage paid at Baltimore, MD, and additional mailing offices.

POSTMASTER: Send address changes to Imagine, P.O. Box 3073, Langhorne, PA 19047.

Imagine is published by the Study of Exceptional Talent (SET) at the Johns Hopkins Center for Talented Youth. This publication is an outgrowth of newsletters and programs that, for twenty-five years, have served highly talented students identified by the Study of Mathematically Precocious Youth and by SET.

Editor • Melissa E. Hartman
Assistant Editor • Diane Clavier
SET Director • Linda E. Brody, Ed.D.
Research Associate • Carol C. Blackburn, Ph.D.
Editorial Assistant • Mary Parker
Editorial Assistant • Rachelle Lipschultz
Designer • Delta Graphics & Communications

Annual subscription: $25.00
Institutions: $30.00

Address subscription inquiries to:
Imagine
P.O. Box 3073
Langhorne, PA 19047
(215) 826-0707 • fax: (215) 788-6887

Address editorial correspondence to:
Melissa E. Hartman
SET/CTY
The Johns Hopkins University
Baltimore, Maryland 21218
(410) 516-0309 • fax: (410) 516-0108
email: mhartman@jhu.edu
Web site: www.jhu.edu/gifted/imagine

Announcements

Back issues on sale for a limited time!

Here's your chance to catch up on back issues of *Imagine* at incredible savings*! Each issue's college review is listed in parentheses.

Just $2 each, plus shipping & handling:

1998-1999
Environmental Science (Pomona)
The Performing Arts (Emory)
Cross-Cultural Studies (Case Western)
Career Discovery (William & Mary)

1997-1998
Literature, Language, & Linguistics (Harvey Mudd)
Public Service & Politics (U of Virginia)
Mathematical Pursuits (Williams)
Multimedia Communications (Northwestern)

Just $1 each, plus shipping & handling:

1996-1997
Planning Ahead for College (Caltech)
Physics & Astronomy (U of Chicago)
Our Global Society (Dartmouth)
Computer Technology (U of Pennsylvania)

1995-1996
Home Schooling (Harvard)
Distance Learning (Rice)
Developing Talent in the Arts (UC-Berkeley)
Magnet Schools and Early College Entrance (Swarthmore)
Pursuing Writing Opportunities (Carnegie Mellon)

1994-1995
Humanities Competitions (University of Michigan)
Science & Technology (Columbia)
Foreign Languages & Study Abroad (MIT)

Call (410) 516-0309 or visit www.jhu.edu/gifted/imagine to place your order.

Back issues from Sept/Oct 1999-Jan/Feb 2000 also available for $5 each.

**$10 minimum order (plus S&H)*

We're looking for a few good readers!

We want *Imagine* to be your magazine, and that's why we're forming the *Imagine* Readers Panel. Tell us what you think of each new issue. Give us your ideas for topics to cover. Help make *Imagine* the best magazine for teens like you!

To become a member of our Readers Panel, tell us about yourself in a paragraph. Be sure to include your age and grade. We'll choose 6-10 readers, whose names will appear in our masthead during the 2000-2001 volume year. Mail your paragraph to Melissa Hartman, SET/CTY, 3400 N. Charles Street, Baltimore, MD 21218 or send an e-mail to mhartman@jhu.edu

Corrections & Changes

In our January/February 2000 issue, we listed an incorrect Web site for the **University of Washington Summer Stretch** (page 31). That address should read http://depts.washington.edu/[illegible]

Please also note that the address for the **SDB Learning Center** (page [illegible]) has changed. SDB Learning Center-CTY, The Johns Hopkins University, 1640 Admiralty Way, Suite 301, Marina Del Rey, California 90292-6613; (310) [illegible]-1100.

Visit our Web site at www.jhu.edu/gifted/imagine

BEST COPY AVAILABLE

COMPUTER TECHNOLOGY

by Jenko Hwong

Have you downloaded the latest Christina Aguilera single from real.com? How about the Galaxy Quest .mpeg trailer? Perhaps you did your holiday shopping online this year, helping the 1999 holiday season break new records in online retail sales. At the very least, you know that it's now rare to find a movie, book, or public figure that doesn't have a URL. But underneath these visible signs, deeper changes are occurring in corporations, educational institutions, and the government that will greatly shape our lives and how we interact over the next decade.

Technology + Information = ...

Computer technology is radically changing how we find, create, and share information. My parents send me e-mail more often than they phone. Instant messaging is supplanting the telephone for real-time chats. Distant parties--from doctors gathering feedback on patient x-rays over the Internet to friends sharing the latest investment tips from the Motley Fools—can share documents and data.

The Web has become a tool for active coordination and collaboration, from online gaming with networked PlayStations to coordinating class-action lawsuits among plaintiffs who would not otherwise be able to find each other. Religious and political groups, such as the thousands of Fa Lun Gong members in China, coordinate meetings via e-mail. The day after the earthquake in Taiwan, my father pointed me to a URL to find the latest news on his hometown near the epicenter and another URL for donations.

In the corporate world, computer technology—in the form of payroll systems, customer service software, marketing databases, warehouse inventory systems, or human resources management, to name only a few examples—helps create, manage, and share crucial information. Successful companies such as Dell, GE, and Walmart are using Information Technology (IT) to gain competitive advantages in their markets, automating business operations with customers and suppliers. From automobiles and steel to books and groceries, most industries have been revamped by IT.

Technological innovation and change is also occurring in research institutions, educational organizations, and government bodies. The Human Genome Project uses computers to control gene-sequencing equipment and help identify, track, and record gene mappings and relate them to diseases. Software simulations supplement clinical work in chemistry, biology, and physics research, while design and simulation software has long aided the fields of electrical and mechanical engineering. Education is also utilizing the Internet to extend the traditional classroom by providing curriculum and registration online.

Technology's People

All of these exciting trends pose great opportunities for work, study, or hobby with computer technology. If you become

RESHAPING OUR LIVES

informed about what's out there and get involved early, your future is bound to be exciting.

When thinking of computer jobs at software companies like Microsoft, most people think of Web-site designers or software programmers. But producing complex, working software requires more than just programmers. Other roles include:

- Quality Assurance Engineers, who test software
- Release Engineers, who take complex software with millions of lines of code and build the right version, and track what has been sent to customers
- Technical Writers, who document the software or hardware, how it works, and how to use it
- Technical Consultants, who install, configure, customize, and extend software or hardware for the customer
- Technical Support Specialists, who help customers or users of computer products solve problems over the phone, email, or Web. Large corporations even have dedicated technical support just for their internal employees, often called a "help desk."

Although these examples come from computer businesses, the same roles apply to research, financial, or educational institutions that need to develop software or hardware. The titles may be different, but the responsibilities are similar.

How to Go Techno

Fortunately, computer technology is a lot more accessible than it was several years ago. Gaining access to a computer and the Internet—ideally by having a computer at home or school—is the natural starting point. Online, you'll find many resources that will help you learn about the computer industry, trends, and opportunities. Check out the search engines, from the popular engines like Yahoo to the multitude of specialized search engines (search on: "Search Engines"). These can lead you to in-depth information on computer technologies and newsgroups where you can read and respond to articles of your interest, as well as get involved with programming. Two great ways to start programming are to look at free source code on the Internet and to use free development tools (Search on: "freeware").

If you're fortunate enough to have computer courses offered at school or the local community college, take advantage of those opportunities. At best, you'll find an outlet for your talents, meet people with common interests, and prepare yourself for the future with solid skills. At worst, you'll discover what you don't like and be better informed about computer topics. Programming courses are best, but any coursework on computers (using applications) is useful.

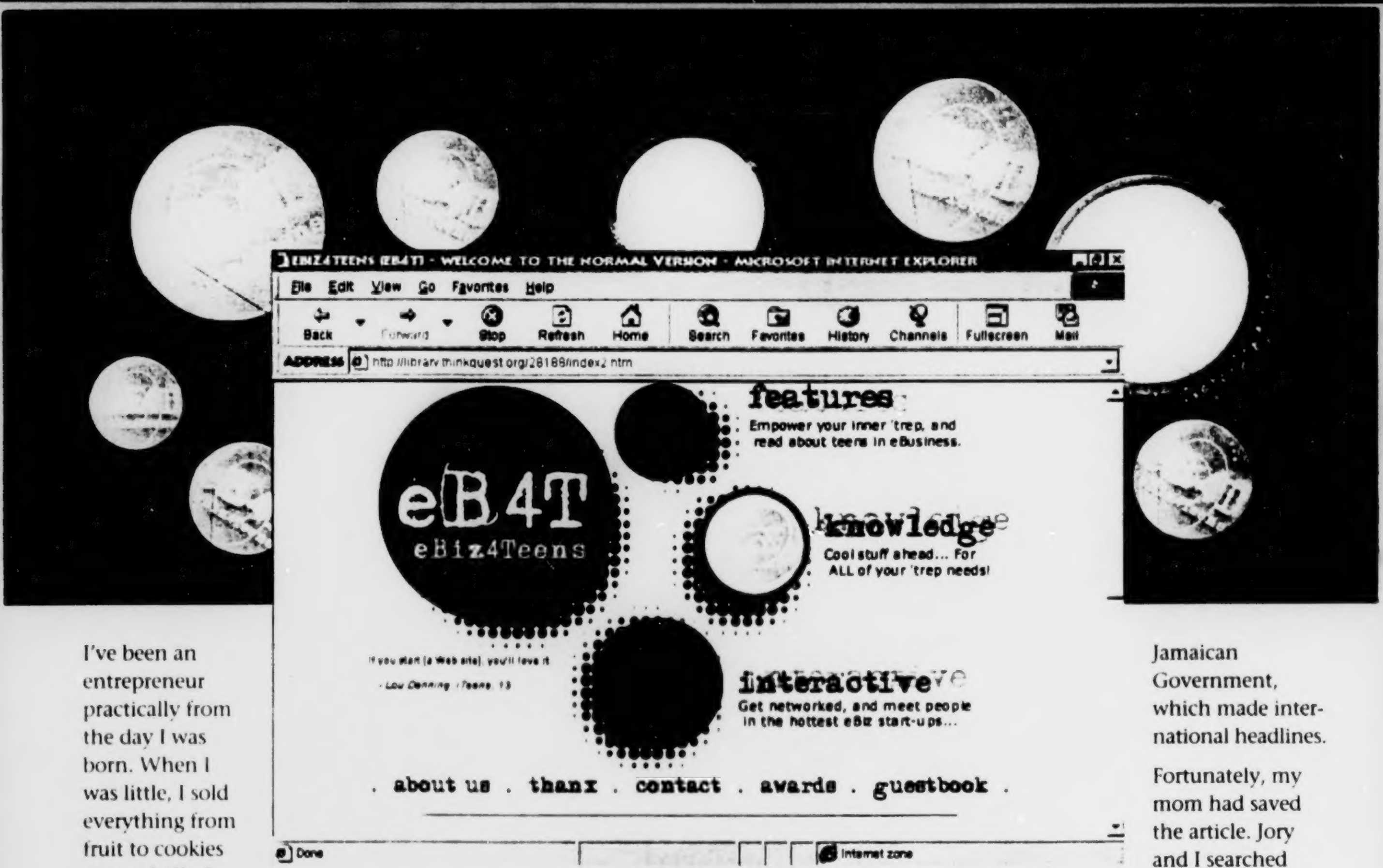
Also take advantage of online opportunities. A lot of Internet Service Providers provide cheap or free Web-site hosting. Play around with designing your own Web page; HTML design skills are good to have. You can also find many cheap or free Web design software packages (Microsoft Office, Netscape Composer, most graphic design tools). You could even offer to help extend the *Imagine* Web site!

If you're contemplating a computer career, you'll want to get more hands-on experience. An internship is a great way to start because it allows you to get practical experience and decide if you enjoy the particular field and role you are experiencing. No matter what, you'll be well-prepared for the future with computer knowledge and skills.

Start with your parents and their friends. Anyone who works in a larger corporation or institution may be able to recommend you for internship opportunities during the summer. Focus on larger organizations with established internship programs, and work on developing strong organizational and detail-oriented skills. Develop your self-reliance and resourcefulness. Become comfortable learning by reading manuals and using online help so that if you're faced with an unfamiliar software application, you can figure things out on your own. If you can demonstrate and further develop these skills during an internship, you'll do well.

Computer technology is a catalyst for change in almost every area of our lives. You can share experiences, interact with a diverse set of people, and affect people's lives in a very positive manner. As Steve Jobs might say, "Let's change the world and improve people's lives." Personal initiative and creativity gave birth to the computer industry, and therein lies our opportunity to become involved, contribute, and grow in any way we choose.

***Jenko Hwong** graduated from Stanford University in 1992 with a B.S. in Computer Systems Engineering and went on to work at several start-up to mid-size software companies in Boston and Silicon Valley. He has been in Boston since 1996 after co-founding Invenio Technologies Corporation, a software start-up that helps large corporations keep their business applications running with real-time diagnostic/monitoring software tools. Email: jenko@stanfordalumni.org*



features

Empower your inner 'trep, and read about teens in eBusiness.

knowledge

Cool stuff ahead... For ALL of your 'trep needs!

If you start [a Web site], you'll love it

- Lou Denning, Teens, 13

interactive

Get networked, and meet people in the hottest eBiz start-ups...

. about us . thanx . contact . awards . guestbook .

The Making of eBiz4Teens

by Melissa Sconyers

I've been an entrepreneur practically from the day I was born. When I was little, I sold everything from fruit to cookies to sea shells. I started my own Internet business when I was 10 years old, offering Web and graphic design services. I'm now 16 years old and a lot more knowledgeable about the Internet and business.

Last March, I decided to apply what I've learned in an entry for ThinkQuest, an international student Web design contest. I wanted to design a site that would combine what I'd learned about both the Web and business—and that's how I conceived the idea for eBiz4Teens (eB4T), a site designed to encourage and inspire teenagers to start their own eBusinesses.

Building an International Team

Now all I needed was a team. I appointed myself team leader and recruited Jory Hanus, a friend who was also interested in computers. Together, Jory and I read the ThinkQuest rules and learned that we could earn extra points for diversity, so we decided to build an international team. As we discussed the best way to do this, I recalled an article I'd read in our local paper about Makonnen David Blake-Hannah. In 1998, at age 13, he had been appointed the Youth Technology Advisor to the Jamaican Government, which made international headlines.

Fortunately, my mom had saved the article. Jory and I searched for hours on the Internet until we found an e-mail address and a phone number. We quickly wrote an e-mail, and then waited breathlessly for those magical three words: "You've got mail!"

We waited. And waited. We waited until 4:00 a.m. and still didn't hear those three words. At about 7:00 I woke to check for a response. No luck. It was getting close to the team finalization deadline, and I was getting edgier by the minute. I decided to give Makonnen a phone call.

At the first ring, I felt my heart leap into my throat only to feel it plummet to my feet when I heard a pre-recorded voice say, "All circuits are busy. Please try again later." After several more attempts, I finally reached Makonnen, who readily agreed to join our team. As we were hanging up, he introduced me to the traditional Jamaican good-bye—"one love"—and later that night, Jory and I ended our conversation with "one love," in honor of our new teammate.

A mere 14 hours before the deadline, we finalized our team and submitted our topic for approval. About a week later, we received an e-mail from ThinkQuest, giving us the green light. We started working right away.

The eBiz4Teens home page (above) gives just a hint of what lies inside for aspiring "eTreps." You'll find a history of eCommerce, advice on getting started and getting noticed, a variety of teen success stories, and some great resources for starting your own eBusiness.

> “eBusiness brings out the true, creative entrepreneur in you. Being able to start a business for a small price, or even for free, is very exciting. Join the Revolution. Start an eBusiness.”
>
> –from the eB4T Web site

Learning Our Roles

At first, we experienced Webmaster's block. We were having trouble creating a design and layout for the site, and without a design and layout, we had a very hard time visualizing and creating content. A month later, after about eight different designs, one design passed the "48-hour test," meaning that we still liked it after 48 hours.

Once we had the design, things started moving faster, until we realized that we weren't working as a team; rather, we were zooming off in three totally opposite directions and accomplishing nothing. Learning how to be a team player was especially difficult for me, since I'm accustomed to being the boss and running the show.

Soon, we established individual roles for each team member but also worked together. For instance, when we were writing the articles, Makonnen would plan out what we wanted to cover, I would fill out the skeleton into an article, and Jory would go over it for details such as grammar and spelling. Then, the three of us would work together to make the article fun to read, adding jokes to keep our readers' attention.

We did most of our work while chatting in messaging programs such as AOL Instant Messenger, using e-mail only if we weren't online simultaneously. Since Makonnen lives in Jamaica, which is still a developing country, there were times when we didn't hear from him for days because of computer or Internet connection problems.

Reaping the Rewards

The ThinkQuest deadline for entries was in mid-August. We had worked very hard, and we were ready. The judging process was very thorough, and there were nearly 1,000 entries. One month after the deadline, they announced the semifinalists, and eBiz4Teens was on the list! The semifinalists' sites were then evaluated again by a different set of judges. Two months after the deadline, Jory and I eagerly scanned the list of finalists, and after getting over the initial excitement of seeing our entry among them, I called Makonnen.

The members of eBiz4Teens in Jamaica, where Melissa and Jory (right) spent two weeks as International Student Tutors at TechSchool 2000. This was the first time they met Makonnen (left) in person. Melissa is now redesigning the TechSchool Web site and plans to visit Jamaica again this year.

In November, the three of us took a four-day, all-expenses-paid trip to Los Angeles for the ThinkQuest Awards Weekend. eBiz4Teens earned the Silver Award (a $5,000 scholarship) in the Interdisciplinary Category, and we thoroughly enjoyed the team reunion, which was sweetened by our success and reward for many months of hard work.

But perhaps an even greater success is revealed on our site. On our Success Story page, many teens filled in a form with their own stories, and I now have countless new entries to add. But they all have one thing in common: they're the stories of teens who created their own opportunities and made them work.

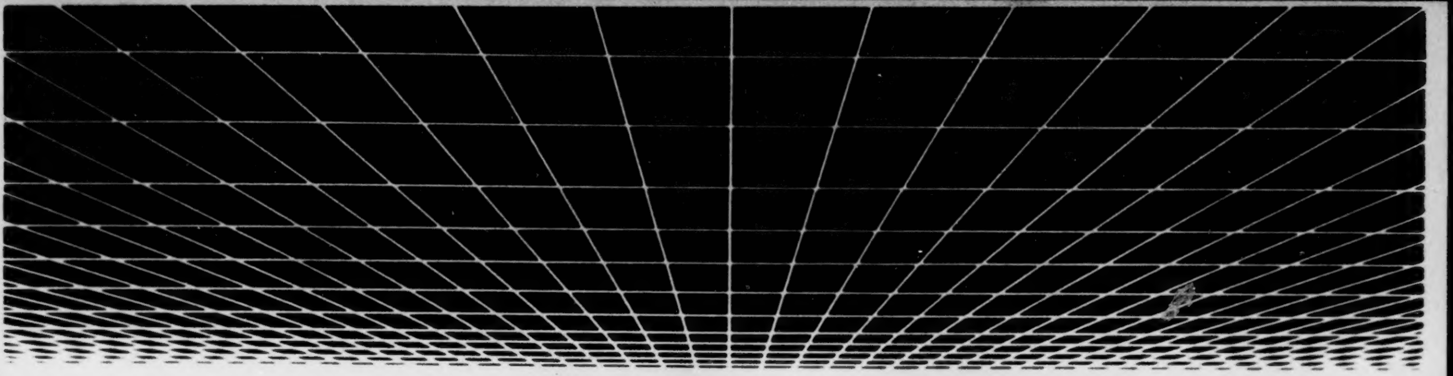
So check out our site. Who knows? Yours might be the next great success story.

Sixteen-year-old ***Melissa Sconyers****, of Austin, TX, is the founder, president, and CEO of ativity design. In her spare time, Melissa enjoys competitive inline speed skating, as well as listening to music, chatting on the computer, and talking on the phone—all at the same time. Like her teammates, Jory and Makonnen, Melissa is homeschooled. For more information about the eBiz4Teens team, visit their Web site at library.thinkquest.org/28188 or e-mail Melissa at melissa976@aol.com*

ThinkQuest

Students 12–19 years old participate in this Web site design contest as members of a two- or three-person team. Team members don't have to be the same age, enrolled in the same school, or even citizens of the same country. Working with as many as three coaches, these teams submit an entry in one of five categories: Arts & Literature, Science & Mathematics, Social Sciences, Sports & Health, and Interdisciplinary. Winning teams share scholarships and cash awards totaling over one million dollars. A similar program for students in grades 4–6, ThinkQuest Junior, was started this year. Prizes include a total of $300,000 in cash, computers, and networking resources. Applications are due in March.

[illegible]



CAUGHT IN THE 'NET

by Ilja Ryzhov

I got caught in the 'Net by chance, and it was one of the best things that has ever happened to me. A little over two years ago, I logged on to the World Wide Web to get help with *Final Fantasy V*, a role playing game for Super Nintendo. I found what I wanted at a site called RPG Classics, which is devoted to electronic role playing games. The site, run by a few devotees of RPGs who had pooled their financial and creative resources, had everything anyone might want to know about RPGs, from monster and spell lists to illustrated walk-throughs of games. I was so impressed that I vowed to make my own RPG site—one that would eventually outdo RPG Classics in number of visitors and amount of information available.

From Incoherent Mess to Budding Internet Giant

Determined to become an eminent Internet personality, I purchased a book that promised to teach me HTML in a week. Within three days, I was able to make primitive files. These incoherent jumbles of text, images, and links soon grew into a coherent and complex system of pages. The time had come to share my endeavor with the online world.

I signed up for a free Web account at fortunecity.com. Then I downloaded a free file transfer program from shareware.com and used it to transfer my HTML files to my account. As easy as that, I was on the Web. Soon my site was expanding, people were visiting it, and I was swamping the RPG Classics Webmaster with e-mails asking for tricks of the trade. Soon my site approached the 20 MB limit of free space. So I began developing an even bigger, more complex site on my hard drive, waiting until I could afford to buy more space on a paid server. That was when disaster struck.

From Competition to Collaboration

On April 26, 1999, after two months of intensive work, my computer refused to boot up and access files. It had been infected by the infamous W95.CIH virus. I was faced with a choice of paying either $2,000 to save my files or a much lower fee to wipe the entire hard drive clean. My entire project was lost. That was the hard way to learn the first law of survival on the Internet: back things up!

By that time, I wasn't as excited by the idea of a huge RPG-related site, so I started looking for new ideas. But that summer, the Webmaster of RPG Classics contacted me. He was starting a new section on his site, a database of texts and music available on the Internet, including walk-throughs, cheat sheets, soundtracks—essentially every type of computer file made for an RPG. He offered me a position maintaining this section. I accepted at once. Although I had originally planned to compete with RPG Classics, working with them has done more for me because I get to interact with both visitors and staff members. Although this job doesn't pay, it has given me a chance to learn the many things I need to know before I can actually realize my ambition of single-handedly making such an impressive site. And I hope one day to start building a career with that knowledge.

The 'Net is not only a repository of useful and useless information, but also the means for satisfying curiosity and creative impulses—whether one's interests lie in music or cinematography or quilting. Every site on the Internet is like a strand in a colossal tapestry. And the more people add to this tapestry, the more colorful it becomes.

A junior at Shenendehowa High School in upstate New York, ***Ilja Ryzhov*** *was born in Russia and came to the United States at the age of five. He enjoys literature and movie classics from around the world, creates and listens to music on his computer, plays RPGs, has taken several courses at nearby Union College, and plans to earn a degree in computer science.*

Selected Resources:

Easy Web Publishing With HTML 3.2 by Jonah Neugass (Que, 1997).

Special Edition Using CGI by Jeffry Dwight, Michael Erwin, and Robert Niles (Que, 1997).

Teach Yourself Java in Café in 21 Days by Daniel I. Joshi, Laura Lemay, and Charles L. Perkins (Sams, 1996).

Teach Yourself Web Publishing with HTML 4 in a Week by Laura Lemay (Sams, 1997).

www.htmlgoodies.com - Primers, tutorials, and extras to make your Web site look great.

Unexpected Success on THE WEB

by Tao Yue

I had just gotten home from school when my mom handed me the letter from Ziff-Davis, the publishers of *PC Magazine*. Several months earlier, I had posted my program *UnitStar* to Ziff-Davis's online shareware library, and this letter notified me that *UnitStar* was a finalist in the 1998 Ziff-Davis Shareware Awards. Other finalists—chosen from nearly 14,000 programs that year—included *ICQ* from Mirabilis and *WinZip* from Nico Mak. I was overjoyed, but a bit skeptical. What was a program written by a 15-year-old doing in such company?

I never dreamt that *UnitStar* would receive such recognition. I developed it as a way to simplify calculations in my honors chemistry class. Because the units of measurement on our lab equipment rarely matched the units given in chemical equations, I spent a lot of time converting measurements from one unit to another. Tired of using lab time to do these conversions, I went online to look for a program that would do them for me. I found a few, but none had all the features I wanted. Some didn't allow me to adjust the number of decimal digits, others were awkward to use, and still others didn't include all the units I wanted. I thought to myself, *I could do better than this*, and the project was launched.

Hacking Out Code

Before this, the only programs I had written were exercises to test my programming skills. At first, I had no idea how complex a Windows program is, but I learned as I went, reading manuals, studying example code, and experimenting. I started by drawing a user interface. Next, I designed the data structures and conversion routines that would make the program functional. Then, I reworked the program to be compatible with other Windows programs. Finally, I filled the program with data, discovering some esoteric facts along the way. For example, I learned that biblical cubits measure the distance between the elbow and the tip of the middle finger.

The finished product could calculate conversions between 500 units, display conversion formulas, and produce conversion tables. It even allowed the user to add custom units. But what to do with my creation? I uploaded it to various Internet software libraries, including ZDNet (Ziff-Davis's online subsidiary), not expecting much. Soon, however, I began receiving requests from people who wanted to buy *UnitStar*—a true success for something that people can use for free. And it eventually received high marks from both Ziff-Davis and *PC World*.

A Helping Hand

Without the Internet, *UnitStar* would have helped only me and a few classmates. As it is, countless people have downloaded it from my Web site. But *UnitStar* is just one way that I've reached out to others via the 'Net. At present, over 7,000 people have used my online Pascal tutorial (listed among the third-party links at the Web site of Inprise, the producer of the Turbo Pascal compiler), and I frequently receive letters of thanks from people who have resolved their sound card problems by logging on to my Web site. This is what I love about the Internet: anyone who wants to help others can publish a site and reach people all over the world. Some see it as a weakness that information on the Web can come from a crackpot as easily as from an expert. But when trustworthy sources recommend a site, the information found there can be considered relatively reliable, and my offerings have gained credibility through endorsements from Ziff-Davis and Inprise. Nobody needs to know that I'm still in high school. On the 'Net, my skills and knowledge can speak for themselves.

What have my online ventures done for me? I like knowing that I've really helped others. And selling *UnitStar* online has allowed me to learn about running a business on my own time and with no prior experience. Best of all, I am part of what the Internet has made possible: a new world in which the question is no longer, "What have you done?" but, "What can you do?"

***Tao Yue**, a senior at John P. Stevens High School in Edison, NJ, is actively involved in math and science-related programs. Last summer, he spent a month at the New Jersey Governor's School for the Sciences. He is also captain of his school's math team and editor-in-chief of the school yearbook. You can check out Tao's programs by visiting his Web site at www.geocities.com/taoyue/*

Get with the Program: USA C[illegible] OLYMPIAD

by Benjamin Mathews

Every year, the International Olympiad in Informatics (IOI) brings together the most promising precollege programmers in the world for two days of intense competition. In this article, Benjamin Mathews, who earned a spot on the U.S. team in both 1997 and 1999, describes the experience of making it to his first IOI.

Have you ever wanted to meet others just as interested in computer science as you are? Have you wanted to hone your programming skills and learn more than the usual high school courses teach you? What if there were also the possibility of traveling to other countries and meeting students from abroad?

If these prospects excite you, then you should consider the USA Computing Olympiad (USACO), an annual competition that culminates in the selection of the four students who will represent the United States at the International Olympiad in Informatics (IOI).

Every year, the USACO runs four contests: the Fall, Winter, and Spring Opens, and the National Championship. Each contest consists of three to five programming problems that are to be solved within five hours. Generally, the problems are of an algorithmic nature, and do not involve any tricky input or output as many other high school programming contests do. In the past, problems have included:

- Finding the largest barn that can be placed on a piece of land without having to fell any trees.
- Finding the minimum length of roads that need to be built to connect a given set of cities.
- Determining the reliability of a network in terms of how many computers would have to fail before the network would be disconnected.

The four competitions, especially the National Championship, are used to select approximately 15 students to attend the USACO training camp at the University of Wisconsin-Parkside over the summer.

But you don't already have to be an incredible programmer to be able to

BEST COPY AVAILABLE

participate in the USACO. One of the main goals of the USACO is to help students learn more about programming and to bring students up to international caliber. Let me relate my experiences as an example.

I was in 9th grade when I first heard about the USA Computing Olympiad in the pages of this very magazine. At the time, I had been using Turbo C++ for over two years, and I thought I had a pretty good idea of what programming was. Therefore, I decided to try my hand at the USACO National Championship that spring. I went into the five-hour competition optimistic, but came out disappointed. While I knew enough to be able to program solutions to most of the problems, I had no idea how to make my solutions fast enough to be competitive. This failure gave me my first idea of how much more there was to learn in computer science than what I knew.

But I did not let my first experience dishearten me. In 10th grade, I subscribed to *hs-computing*, the USACO mailing list. Through this list, I received Challenges of the Week, programming problems designed to help prospective programmers learn the ropes and practice their skills. I participated in the two Internet competitions that year, and finally, by the time the next National Championship came, I was much better prepared. That year, I did well enough to earn a spot at the USACO training camp at the University of Wisconsin–Parkside.

The training camp was an intense mixture of hard work and fun. We had daily lectures, labs, and discussions, during which I learned many times what I had learned on my own over the past year. It was there that I became truly interested in the mathematical and algorithmic side of computer science. But the training camp was not all work—we spent a good deal of time playing games. The camp favorite is always ultimate frisbee, but we also found time to play a business simulation, to pit computer programs we had written against each other in a computerized version of Mancala, and to play card games nearly every night. We used this time wisely to relax and get to know one another—to share the programming projects we had worked on, to discuss our schools and their computer science classes, and simply to make friends.

However, the team for the international competition still had to be chosen. By the time the final round came, I had picked up most of the skills necessary to produce fast programs. I was chosen to be part of the team that would go to South Africa to compete in the IOI.

> “By the time the final round came, I had picked up most of the skills necessary to produce fast programs. I was chosen to be part of the team that would go to South Africa to compete in the IOI.”

The IOI was a wonderful experience. Aside from the fact that Cape Town and the Cape of Good Hope are stunningly beautiful, I again had the opportunity to meet other good programmers, but this time they were from other countries.

Even though the environment at the IOI was competitive, it also lent itself well to camaraderie. The problems themselves gave everyone a common enemy, so we spent a great deal of time commiserating about the difficulty of the problems or comparing our solutions. Especially during the tense moments when our programs were being graded, everyone was very supportive. We all wanted to do well, but we also wanted everyone else to do well, too.

This year, the USACO National Championship will be held on April 12, and the IOI will be held in Beijing on September 23–30. I encourage you to try out for the US team, even if you feel you don't yet have the skills necessary for international competition. Start by going to the USACO Web site (www.usaco.org) and trying some of the problems from past contests. Many problems have solutions posted that explain the algorithms involved, and even the actual test data that was used in grading the problems. In addition, join the *hs-computing* mailing list (instructions are on the Web site). Through it, you will receive the Challenges of the Week, as well as information on the four annual contests. Try some of the challenges and the contests, and don't give up if you don't succeed at first—you'll be gaining skills and knowledge that you might use someday at the IOI and beyond.

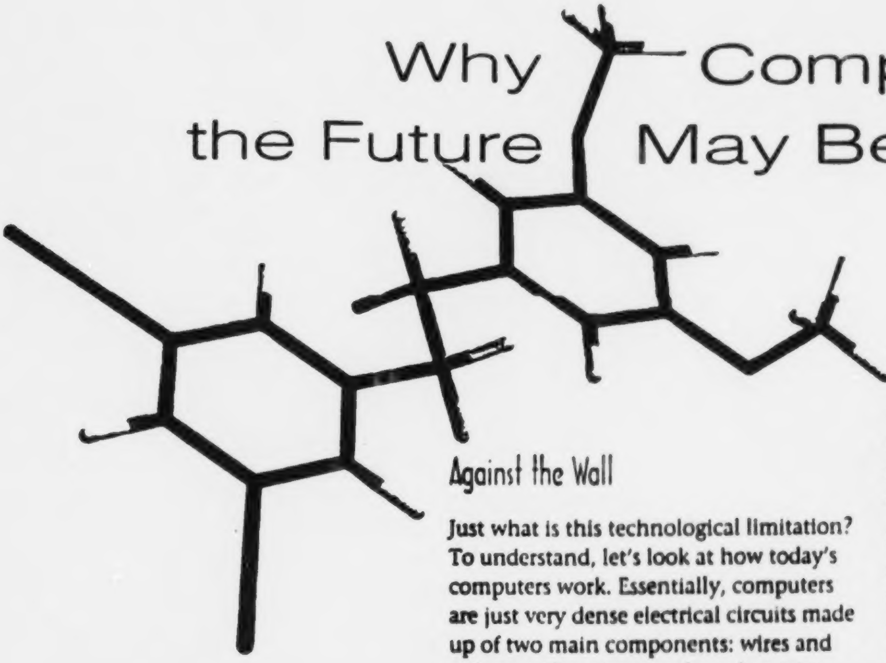
In addition to competing in the IOI, ***Benjamin Mathews*** *also attended the 1999 International Physics Olympiad. He is currently a freshman at Caltech, studying physics and math. In his now-rare spare time, he enjoys juggling, card games, and, of course, ultimate.*

BEST COPY AVAILABLE

Short Circuit:

Why Computers of the Future May Be Organic

by David Moore



Top: A 3-D rendering of the molecular electronic diode David studied.

It's almost a law of nature: computers just keep getting smaller. This phenomenon is so widely recognized that it even has a name: Moore's Law (of no relation to the author), which states that the number of transistors that can fit on a chip doubles every 18 months. A welcome by-product of this ongoing process of miniaturization is a steady increase in computers' power and speed.

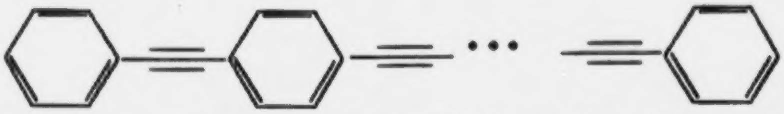
Moore's Law has held true for 40 years. However, computer technology is approaching what many engineers consider the "brick wall" for existing technology. In less than ten years, we may be faced with the fact that computer components as we know them simply cannot get any smaller. Such a scenario could cause problems for a society that has grown to expect more powerful computers (and cooler electronic gadgets) every year.

Against the Wall

Just what is this technological limitation? To understand, let's look at how today's computers work. Essentially, computers are just very dense electrical circuits made up of two main components: wires and switches. The wires conduct electricity, while the switches enable a computer to make decisions. Anything a computer does can be expressed in a language of ones and zeros, and it is the on/off nature of the switches, or "transistors," that allows ones and zeros to be stored, added, multiplied, and logically combined in electrical circuits.

In modern computers, these devices are now so small that millions of them could fit on your fingernail. Both wires and switches are made of materials that conduct electricity. Wires are made out of ordinary metals, like copper or aluminum, while switches are fabricated from materials such as silicon, termed "semiconductors" because of their selective conductivity. Through a process called photolithography, wires and switches are photographically imprinted onto silicon wafers to create microchips.

The flow of electrons through wires and switches results in the transmission of electrical information. Computers get faster as wires and switches get smaller and are positioned closer together. As the distance electrons must travel becomes smaller, they take less time to traverse a circuit, and a processor can move on to the next piece of information more quickly. For the past half-century, a continual process of ever greater miniaturization of wires and switches has allowed the industry to create faster and faster computer chips.



A molecular electronic "wire" composed of benzene molecules linked together to form a polyphenylene chain.

In a few years, however, wires and switches will become so small—just a few nanometers wide—that they approach the size of individual atoms and molecules. (A nanometer is one billionth of a meter, or about 10 atomic diameters.) At those sizes, the conventional laws of physics that govern the flow of electricity through metals break down and give way to the laws of quantum mechanics. In short, the switches stop working.

A New Approach

Scientists are already at work on alternative technologies that would make use of quantum mechanical effects rather than be defeated by them. More than just perpetuating Moore's Law, technologies now in development may bring unprecedented leaps in computing power.

One such technology, molecular electronics, may bring about a fundamental change in the way we build computers. Unlike current computer technology, molecular electronics will use *individual molecules* as the building blocks. Since molecules bond and interact according to the rules of quantum mechanics, they are the logical choice for the building blocks of nanometer-scale electronics. By constructing wires and switches out of individual molecules, molecular electronics may permit the design of computers up to a million times smaller and many times faster than today's.

To construct a nanometer-scale computer, we will need to build molecular wires and switches—that is, single molecules capable of conducting and controlling electrical currents. Wires are the simpler circuit element, and they will be the easier one to construct on a molecular scale. By linking a number of hexagonal molecules called benzene rings (C_6H_6) into a long strand, a conductive wire can be created. The atoms in benzene (and its chemical cousins) have the unusual property of sharing electrons in a "delocalized molecular orbital"—a region of freely-moving electrons above and below the plane of the molecule. The natural fluidity of its electrons makes benzene highly conductive to electricity. When linked in long chains, called polyphenylene chains, benzene rings can transmit electrons freely from end to end. Such a molecular wire has actually been synthesized, and experiments have shown that it is much more conductive than metal wires of the same scale.

Switches are the more complex elements in a circuit, and they will be the more difficult ones to design and fabricate on a molecular scale. They will be constructed from the same polyphenylene backbone; but by adding molecular subunits or "substituents" to that backbone and by introducing insulating subunits into it, molecular devices like switches can also be created. A few molecular-scale switches have been synthesized and tested; however, much of the research on molecular switches is still only theoretical because of the difficultly at present of constructing and testing the molecules of interest.

Modeling a Molecular Switch

One switching device important in logic circuitry is a "rectifying diode," which conducts electricity through itself in only one direction. When combined with other diodes, it can emulate the switching abilities of its more complex cousin, the transistor. The summer before my senior year of high school, I participated in a research project to predict the behavior of a possible design for a molecular electronic diode.

That summer, I was an intern in the Nanosystems Group at The MITRE Corporation in Reston, Virginia, where I was part of a research group led by Dr. James Ellenbogen. My project was to use computer modeling to predict the electronic behavior of this possible molecular electronic diode—a molecule that had never actually been built. My goal was to calculate quantitatively the behavior of the molecule as if it were in a circuit, to see whether it would in fact act as a rectifying diode. I used a commercially-available computer simulation program to estimate the chemical properties of the molecule. Then, once I had the chemical properties, I used a computer program I wrote to derive the molecule's electrical properties—its behavior in a circuit. My research showed that the molecule probably would operate as anticipated if it actually were synthesized and used in a molecular circuit.

Remaining Mysteries and Challenges

While this and other research moves us closer to the first molecular electronic computer circuits, much work remains before they will be the basis for a feasible alternative to existing microchip technology. As yet, no one knows how to build a molecular electronic computer chip. Synthesizing some of the complex chemical structures needed for molecular circuits seems difficult given our current knowledge of chemical synthesis. Even more daunting is the challenge of precisely positioning individual molecules on a nanochip and connecting them to other circuit elements. The processes used to manufacture contemporary silicon microchips are not precise enough to manipulate individual molecules. And even if chemists could build the molecules and engineers could organize them in orderly circuit patterns, it will require technological breakthroughs before we can interface such tiny circuits with larger-scale devices like keyboards and monitors.

Despite the remaining hurdles, molecular electronics shows great promise and, if realized, would bring about radical changes in the way we view computers. We may find ourselves living with "smart dust"—computers that are nearly invisible to the naked eye, yet almost as powerful as current PCs. Such microscopic computers could be integrated with everyday objects in our daily lives to make our lives easier and better. Potential applications of this kind of miniaturization include medical monitoring devices, lifelike human prosthetics, and "smart paint" that could act like a giant TV over an entire wall.

Get Involved

Exploring this future face of computing by doing research was a highly rewarding experience, and I encourage others interested in science to find ways to get involved. You can always find research organizations or corporations in your area that are interested in having summer students. Whether you are interested in computers of the future, biotechnology, chemistry, or some other area of science, nothing can compare with real-world experience.

A freshman studying electrical engineering at Caltech, ***David Moore*** *graduated from the Math/Science Magnet Program at Montgomery Blair High School in Silver Spring,* ***MD. For his research on molecular electronic diodes, he was awarded Second Place in the 1999 Intel Science Talent Search. On the side, he is a computer hobbyist who enjoys writing free software. His Web site is: www.ugcs.caltech.edu/~dmoore***

For lots more about molecular electronics, see www.mitre.org/technology/nanotech/

BEST COPY AVAILABLE

The Science of Language: COMPUTATIONAL

by Jason Eisner

If you love language, a career in computer science might not spring to mind as the best way to pursue that interest. But, as this young professor discovered, teaching computers to learn language not only presents challenges you won't find in your English classroom, but also provides a whole new way to appreciate the complexity of language.

In sixth grade I felt that I was a pretty good programmer, having gotten our classroom TRS-80 to play a game of craps. It was a companionable machine, with a comfortable 4K of memory, and for my next project I decided to program it to converse with me. Twenty years later, I'm still working on it—having learned a lot more about computer science, human language, and mathematics along the way.

The Turing Test

Back in 1950, the mathematician Alan Turing, one of the great founders of computer science, famously proposed conversation as the test of artificial intelligence (AI). He argued that if a computer could successfully pass as a human for 30 seconds of typed conversation, we might as well call it intelligent. Like me, he underestimated the problem, predicting it would be solved by 2000. I'm secretly glad it turned out to be hard enough to give me a lifetime of interesting work!

Turing was picturing college-level conversations about Shakespeare and chess puzzles. He didn't realize that even simple language requires a daunting amount of knowledge and reasoning ability. How would a computer figure out that "they" refers to different groups of people in the following two sentences?

> *The city council denied the marchers a permit because they feared violence.*
>
> *The city council denied the marchers a permit because they advocated violence.*

Some computational linguists already try to build "deep" language systems that can do this. Such systems "understand" enough about a specialized topic, like city permits or travel planning, that they can not only figure out what you mean, but also draw appropriate conclusions that let them help you out.

What Computers Need to Know about Language

Many of us are more focused on understanding the special properties not of city permits, but of language itself. A major concern of AI is to get computers to **represent**,

LINGUISTICS

use, and **acquire** facts. So the big questions are: Exactly what facts do you subconsciously know about your language? How do you make use of them? And how did you figure them out as a toddler, just by listening to other people make sound vibrations in the air?

The language facts I'm talking about (you know millions) include where the verb goes in a sentence, which words in the dictionary are related, which sounds can get dropped in fast speech, what the present perfect tense ("have eaten") means logically, and when it is appropriate to use "herself" rather than "her." These are all very hard questions to answer fully (try it), and it's amazing that you tackled them at age four!

So how should a computer represent, use, and acquire such facts? To **represent** the facts of a given language, we would prefer to use a single scheme that is flexible enough to deal with any human language—just as a baby's brain is flexible enough to learn English, Korean, Sanskrit, Warlpiri, or Zulu. To devise such schemes (an ongoing job!), we draw on the work of linguists who study all those languages. For our purposes the schemes have to be quite formal, and they often use some discrete mathematics, like graph theory and abstract algebra.

Using the facts of a language to solve a problem requires us to design algorithms. Different problems call for different algorithms. We work, for example, on algorithms to take spoken dictation, diagram sentences, translate from one language to another, summarize email, figure out whether you confused "their" with "they're" or "there," read aloud with natural intonation, and convert news articles into databases of facts.

Learning a language automatically is like doing automatic scientific discovery. We can give a powerful computer a lot of data—for example, two million sentences from the *Wall Street Journal*— and ask it to search for hypotheses that explain the data well but also conform well to our general scheme for describing human languages.

Learning is Ambiguous

To get a sense of the problems, suppose I tell you that "Time flies like an arrow," a sentence you hadn't heard before.

If you don't speak English, you're up a creek: so far as you know, I could have meant anything at all.

If you know how English does and doesn't permit ideas to be expressed, you will be able to narrow my meaning down, but not completely! Maybe I was making a metaphorical remark about time, or a literal one. Maybe I was instructing you as to how you should time the flies, or which flies to time. Maybe I was telling you about a fly species called "time flies" that are fond of a particular arrow, or arrows in general. (Groucho Marx quipped that time flies like an arrow, but fruit flies like a banana.) Or maybe what I actually said was "Tie 'em flies, like in our row." All of these interpretations are possible in principle, and an appropriately programmed computer can come up with them.

If you also know what happens frequently in English, you can rule out most of these interpretations as possible but unlikely. Most sentences do not start with verbs, "time" is usually an abstract noun, and "like"is usually a preposition. Furthermore, you've heard people say "The time sure flew past tonight," but never "Look at those time flies." All these little bits of evidence add up somehow to nudge you toward reading the sentence as a remark about time. Probability and statistics turn out to be extremely useful tools in getting computers to add up such evidence.

A wonderful introduction to such issues is Steven Pinker's *The Language Instinct* (1994). It focuses more on linguistics and psycholinguistics than on computational linguistics, but it should get your mind churning.

The Best of All Worlds

What I love most about my field is that it engages every part of my mind. For me, it was a way to get the benefits of majoring in writing, empirical science, math, computer science, and engineering all at once, without losing focus. As a researcher, I like to keep crossing that spectrum: noticing nuances of language, trying to fit them into patterns, turning those patterns into rigorous mathematics, developing algorithms to work with the mathematics, coding those algorithms as programs, and studying how well the programs do.

The social aspect of research is also fun for me—collaborating with colleagues, giving talks at conferences, and participating in my research community by reviewing other people's papers and organizing workshops. In addition, since I chose to work at a university rather than an industrial lab, I help train the next generation of computational linguists and also get to teach other topics in computer science. It's a good full life, and it sure beats a lifetime of playing craps with a 4K TRS-80.

*A new assistant professor, **Jason Eisner** took his first computer science class at CTY in 1982, the first year that class was offered. He is one of several faculty at the University of Rochester who study how humans process language and how to get computers to do the same. He's currently developing a statistical approach to learning grammatical transformations (the basis of Noam Chomsky's linguistics revolution in 1957). He's also been bringing computer science techniques to a current revolution in phonology (the study of how languages combine sounds).*

Exciting Developments

Perhaps you enjoy programming because it allows you to extend your computer's capabilities. Maybe you like the challenge of solving a problem with a combination of ingenuity and code. Whatever your attraction to programming, the skills you're developing can serve you well in a career. In the following articles, two young programmers describe their careers in software development and engineering—careers they hadn't envisioned even a few years ago.

Software Development

by Joshua Koppelman

When I left the Computer Science Ph.D. program at MIT four years ago having completed everything but my dissertation, many of my friends and family thought I was crazy. But I had finally decided that academia was not for me. Instead, I set out for a software development position with a small enterprise software company in Austin, Texas, named Trilogy. I came to Trilogy knowing that the company specialized in "Front Office Software"; that is, that they wrote software which allowed Fortune 500 companies like Boeing and Hewlett Packard to sell their products more efficiently.

To be honest, I had very little idea what I would be working on when I arrived, but I did know that I loved to program and that I really wanted to be challenged by working on extremely difficult problems. After meeting the current employees (most were MIT and Stanford alumni), I was convinced if they were being challenged, so would I.

I was promised the opportunity to build an entire software system from the ground up; if there was a market for it, Trilogy would sell it for millions of dollars. For a couple of months, I worked on existing products. Then, one day the CEO came into my office and mentioned that he had a great idea for a new product that he wanted me to work on. He had noticed that many companies with large sales forces spend huge amounts of money tracking, paying, and communicating commissions. These companies have a large number of rules that govern how people are paid their salary, based on product sales, regional sales, goals, rebates, competitions, etc., and they employ fleets of people whose primary function is to pay other people's commission. Further, no one person in any of these companies actually understands all of these rules.

When I heard this idea, frankly, I was disappointed. I mean, I liked the idea that tens of thousands of people would be using my software, and he had convinced me that there was a huge opportunity to make money, but "commission software" sounded boring. I promised him I'd think about it. I met with a commission expert who had recently been hired to work on the marketing and sales of this as-yet-unwritten product. I realized that the

problem itself was amazingly complex, both because of the variety of ways people get paid and because of the number of sales that the system would have to track—millions a day.

For the next nine months, I designed the first version of the product. At the beginning, the system consisted of an engine, with tens of thousands of lines of C++ code, and a user interface (which people would use to talk to the engine) with about half as many lines of Visual Basic code. While I was coding, my partner spent all of his time on the road, talking to sales companies, trying to convince them to buy this product, and sending back feature requests to me.

At some point, I realized that the product just would not get where it needed to be unless I took a more active role in meeting with customers. So I started spending more of my time on sales calls, presenting the technical architecture, explaining how it would solve the customers' problems, and discussing the new features they would need added. It wasn't long until we made our first million dollar sale (and boy, did I party). As the product grew and the customer base increased, the team grew to about 10 people, and I moved into the role of development manager. Today, there are about 50 consulting, marketing, and sales people working directly on the product, and it has generated more than 100 million dollars in revenue (Trilogy's second biggest product). In addition, there's a patent pending. Now *that's* exciting!

Developer Support

by Lori Hylan

My father wanted me to be a computer science major. His reasoning was sound: I obviously had an aptitude for computers and programming, and he rightly guessed that I could get a well-paying job with a C.S. degree. I think he was a little disappointed when I told him I'd rather major in English.

I've never regretted getting a liberal arts education; it taught me how to think critically and write concisely. I've never stopped using these skills, even as I moved into progressively more technical positions. In fact, writing is a large part of my current job as a senior developer support engineer.

Just about anyone who knows JavaScript can add their own custom features to Dreamweaver, the product I work on, by writing files called extensions. Dreamweaver has an extensive application programming interface, or API, that gives extension developers access to virtually every part of the product through JavaScript functions. One of my responsibilities is to document the API: to explain what each part of the API does and how it works, and to write sample extensions that developers can use as a guide. It all adds up to 312 pages of blood, sweat, and code—an accomplishment I'm proud of.

Another part of my job concerns helping extension developers directly, and it also involves writing. In this case, however, I'm writing e-mails rather than manuals. Often developers understand the concepts in the API manual, but they have trouble putting those concepts into practice. I help them turn their ideas into extensions by suggesting engineering approaches or workarounds and by debugging their JavaScript code.

Debugging is one of my favorite tasks. It appeals to the side of me that finds forensic science fascinating: the part that wants to know what went wrong and why. I'm regularly heard shouting, "I love my job!" whenever I find and fix a bug.

Perhaps what I love most about my job is contributing to the success of a product while working with a brilliant and funny bunch of engineers who teach me new tricks every day. It also helps that I make great money using both my writing and my computer skills. Dad isn't disappointed anymore.

*—**Joshua Koppelman** received bachelor's degrees in computer science and applied mathematics, and a master's degree in computer science (artificial intelligence) from MIT. He is currently the director of development at CarOrder.com, a subsidiary of Trilogy Software, Inc.* ▲

*Despite her bookish background, **Lori Hylan**, who earned a B.A. in English at the University of Georgia, is a ferocious geek who regularly dreams in JavaScript and HTML rather than her native English. She enjoys reading, sleeping, eating, and watching movies. To combat these couch-potato tendencies, she commutes to work by bike and regularly flies off to whatever city offers the best e-fare that weekend.*

SELECTED PROGRAMS AND RESOURCES II

Although this listing includes many of the most interesting and exciting resources we discovered in preparing this issue, there are countless others appearing on the Web daily. Girls in particular will find a wide variety of sites and organizations dedicated to helping them pursue their interests in computers and technology. So start with our recommendations, but be sure to explore some of the links and resources offered on these Web sites.

COMPUTER
TECHNOLOGY

Competitions

ACSL Computer Science Contest
American Computer Science League, Box 40118, Providence, RI 02940; (401) 822-4312; info@acsl.org; www.acsl.org
Note: Because this contest is administered by schools, students should not contact the ACSL directly. This contact information is provided for **teachers only**: the ACSL will not respond to student or parent inquiries.

Three- and five-member teams in four divisions—Senior, Intermediate, Junior, and Classroom—compete in four contests that take place during the school year. In each contest, after responding to short theoretical and applied questions, students solve a practical problem within three days. They then test their solution on ACSL data using their school's computer facilities. The team's faculty advisor submits student responses to the ACSL. Outstanding students and schools receive prizes at the local and regional levels; top schools nationwide participate in an invitational All-Star Contest. **Deadline**: late December.

Association for Computing Machinery High School Programming Contests
www.acm.org/chapters/stu/hscontests.html

Some university chapters of the ACM sponsor programming contests for their local high schools. Rules and dates vary; inquire at individual chapters listed on Web site.

Continental Mathematics League C++ Computer Contest
Continental Mathematics League, P.O. Box 2196, St. James, NY 11780-0605; (631) 584-2016; Quartararo@xoommail.com; www.li.net/~majorbar/cml

Like all CML events, the C++ Contest is a test administered in schools. Students work individually on the 25-question multiple-choice test; the top six scores become the school's team score, which is then sent to CML for national ranking. **Deadline**: early October.

Imation Computer Arts Scholarship Program
Imation Enterprises Corp., 1 Imation Place, Oakdale, MN 55128-3414; (888) 466-3456 (only for school representatives requesting entry packets); info@imation.com; www.imation.com/about/scholarship/content/0,1011,152,00.html

High schools must request entry packets to enroll students in this scholarship program that recognizes creators of outstanding original works of computer-generated art. One hundred finalists will receive a Certificate of Excellence, and 25 distinguished finalists will receive a $1,000 scholarship, a medallion, a trophy for their school, and a trip to the national recognition event. **Deadline**: mid-December.

Lucent Global Science Scholars Program
Lucent Global Science Scholars Program, National Alliance for Education, 63 Riverside Avenue, Red Bank, NJ 07701; (732) 747-0028; www.excellence.org

This international competition is open to high school seniors planning a career in the field of information technologies. Fifty winners each receive $5,000 scholarships, attend the Lucent Global Summit, and are considered for summer internships with Lucent Technologies after completing their freshman year of college. **Deadline**: mid-January.

ThinkQuest
See page 7 for information and an article about this competition.

The Trinity College (Hartford, CT) Fire Fighting Home Robot Contest
Jake Mendelssohn, 190 Mohegan Drive,
West Hartford, CT 06117;
JMENDEL141@aol.com;
www.trincoll.edu/events/robot/

Entrants of any age from all over the world build a computerized (not radio-controlled) robotic device that can move through a model of a single floor of a house, detect fire (a lit candle), and then put it out. Cash prizes ranging from $50 to $1,000 are awarded in each of two divisions: Junior, for high school and younger students; and Senior, for participants older than high school age. The competition is open to teams and individuals. **Deadline**: This year's competition will take place on April 16; no registration cutoff.

U.S.A. Computing Olympiad
USACO, University of Wisconsin–Parkside,
Box 2000, Kenosha, WI 53141-2000;
(414) 595-2231; piele@cs.uwp.edu;
www.uwp.edu/academic/mathematics/usaco.htm

Based on their performance in the Fall, Winter, and Spring Opens (Internet contests) and the National Championship (a five-hour proctored competition), 15 high school students—who must have Internet access to compete—will be selected to attend the USACO Olympiad Training Camp. Four of these students will then become members of the U.S. team that participates in the International Olympiad in Informatics. **Deadline**: Students should join the competition in September. (For a first-person account of this contest, see page 10.)

Educational & Apprenticeship Programs

The Backyard Project
www.backyard.org

The Backyard Project seeks to build young women's awareness of careers in the computer industry. The Project does this through the hosting of field trips to high industry offices, sponsorship of career day conferences, disseminating information to high schools, and coordinating interviews for Backyard Girls with industry role models.

The Project also sponsors a summer computer camp for girls interested in careers in the computer industry.

Boy Scouts of America Explorers at Langley Research Center
Patricia A. Link, Mail Code 400, Langley Research Center, 17 Langley Blvd., Hampton, VA 23681; (757) 864-8102;
p.a.link@larc.nasa.gov; www.larc.nasa.gov

This career exploration program allows male high school students age 16 or older to meet individuals currently working in their career of interest, including computer science, visit actual work sites, and gain experience with the tools of the trade. The program runs from the first Tuesday in October through the first Tuesday in May.

Brandeis Summer Odyssey Programs
M.S. 085, Brandeis University, P.O. Box 9110, Waltham, MA 02454-9110;
(781) 736-2111; odyssey@brandeis.edu;
www.brandeis.edu/odyssey

High school students interested in computer science may choose either a Directed Research Project or a Science Research Internship in this program.

In the Directed Research Project, students study concurrent processing in which multiple processors cooperate on a task, but, at the same time, compete for common resources. **Application deadline**: April 1 for students seeking financial aid; May 15 for those who are not.

Students in the Science Research Internship are assigned a mentor, with whom they investigate an important research topic. By the end of the program, students will complete a project, write a paper in typical journal format, and participate in a symposium detailing their research experiences. **Application deadline**: May 1.

CTY Summer Programs in Computer Science
Center for Talented Youth, Summer Programs, 3400 North Charles Street, Baltimore, MD 21218 (410) 516-0278;
iaay.programsinfo@jhu.edu;
www.jhu.edu/gifted/programs.html#summer

Theoretical Foundations of Computer Science, Digital Logic, Data Structures and Algorithms, and Programming in Scheme are offered in three-week residential summer sessions. Course catalogs, including complete course descriptions, are available on the Web site.

Goddard Space Flight Center Mentor/Mentee Program
Ron Erwin, Mail Code 130.3, NASA GSFC Education Office, Greenbelt Road, Greenbelt MD 20771; (301) 286-7504;
rerwin@pop100.gsfc.nasa.gov;
http://education.gsfc.nasa.gov

Students over 16 years of age work with a scientist or engineer during the school day for a period of time determined by the school, or during the summer for a minimum of three weeks. By the end of the program, each mentee presents an exhibition of work done with the mentor.

Requests for mentor/mentees are made by the students' schools. Sessions are held yearly with the following deadlines for application submission: Spring: October 15; Summer: April 15; Fall: July 15.

Goddard Space Flight Center Summer Institute for Science, Technology, Engineering & Research
Joan G. Sanders, Mail Code 130.9, Education Office, Goddard Space Flight Center, Building 28, Room N144, Greenbelt, MD 20771;
(301) 286-017;
jsanders@aesp.nasa.okstate.edu;
http://education.gsfc.nasa.gov

The SISTER program provides female students entering eighth grade with the opportunity to explore non-traditional career fields through mentoring sessions, speakers, demonstrations, a local field trip, and group activities. The non-residential program runs the last week of June. **Application deadline**: April 15.

Goddard Space Flight Center Visiting Student Enrichment Program
Marilyn J. Mack, Mail Code 933, Goddard Space Flight Center, Greenbelt Road, Greenbelt, MD 20771; (301) 286-4638;
marilyn.j.mack@gsfc.nasa.gov;
http://education.gsfc.nasa.gov

In this 10-week summer program, a limited number of high school, undergraduate, and graduate students work with GSFC mentors on a science-related project based directly or indirectly in computers. Students receive a stipend during the program. Out-of-town students are housed at the University of Maryland.

Continued on page 20

The Role Model Project for Girls
www.womenswork.org

Womenswork.org was created to address the needs of girls and young women seeking a career in non-traditional fields by providing role models and information for them. The Role Model Project consists of a CD-ROM, supplemented by the Web site which offers links to schools, alternative programs, mentoring, and other means of access to these professions.

Summer High School Apprenticeship Research Program
Lisa Williams, Mail Code 130.3, Modern Technology Systems, Inc., 6801 Kenilworth Ave., Suite 200, Riverdale, MD 20737; (301) 985-5171; http://ehb2.gsfc.nasa.gov/edcats/1999/nep/programs/index.html

SHARP is an intensive 8-week science and engineering summer program for high school students (ages 16 and over), held at various NASA facilities across the country. Students participate in research and prepare written final reports and abstracts of their studies; students are paid minimum wage or GS-1 wages for 40 hours per week.

QEM Network/NASA SHARP PLUS Research Program
The Quality Education for Minorities (QEM) Network, 1818 N Street, NW, Suite 350, Washington, DC 20036; (202) 659-1818; qemnetwork@qem.org; http://qemnetwork.qem.org/sharpplus.html

SHARP PLUS is a research-based mentorship program that allows apprentices age 16 and over to work with industry- or university-based professionals over the course of 8 weeks and engage in hands-on research. Students live on a college campus and participate in a variety of enrichment activities.

During the apprenticeship, students carry out research assignments, prepare reports, and make oral presentations. Students will also prepare final written reports on their research to be submitted to NASA, and are required to participate in a community service focused Academic Year Project upon their return to school in the fall.

Professional Organizations

If you're interested in a career in computer technology, these organizations may be able to provide some helpful information. You can also learn about current topics of interest in the field and find some interesting and relevant links by visiting their Web sites.

American Association for Artificial Intelligence
445 Burgess Drive, Menlo Park, California 94025-3442; (650) 328-3123; info@aaai.org; www.aaai.org

The American Society for Information Science
8720 Georgia Avenue, Suite 501, Silver Spring, MD 20910-3602; (301) 495-0900; www.asis.org

Association for Computing Machinery
ACM, 1515 Broadway, New York, NY, 10036; (800) 342-6626; www.acm.org (Note: This organization allows membership to high school students. Inquire about starting a chapter at your school, and see the Web site for a listing of activities for students in grades K–12.)

Association for Women in Computing
41 Sutter Street, Suite 1006, San Francisco, CA 94104; (415) 905-4663; awc@awc-hq.org; www.awc-hq.org

Association for Women in Science, Engineering & Mathematics
2000 NW Walker Road, Beaverton, OR 97006; (503) 746-1504; info@awsem.org; www.awsem.org

Computing Research Association
1100 17th Street NW, Suite 507, Washington, DC 20036-4632; (202) 234-2111; info@cra.org; www.cra.org

IEEE Computer Society
10662 Los Vaqueros Circle, P.O. Box 3014, Los Alamitos, CA 90720-1314; (714) 821-8380; www.computer.org

Publications

Crossroads
www.acm.org/crossroads

This publication is produced by student members of ACM (Association for Computing Machinery). It appears quarterly in print and on the Web; print subscriptions are $15.00 per year for high school students, which includes basic membership in ACM. Recent articles included "Open Math and Math ML: Semantic Mark Up for Mathematics" and "XML: the Future of the Web."

Fatbrain.com
(800) 789-8590 or (408) 845-0402
www.clbooks.com; contact-us@fatbrain.com

Formerly ComputerLiteracy.com., this online bookstore offers thousands of publications relating to computer science, programming, and other computer topics.

Web Sites

About.com: Computer Science
http://compsci.about.com/

This Web site provides links to courses, articles, forums, glossaries, organizations, and other information relating to computer science, administered by an expert guide.

Computer Science Resources
www.englib.cornell.edu/ice/lists/computer-science/html; engrref@cornell.edu

A site devoted to links to journals and other research material relating to computer science. While some of the material can be accessed only by Cornell students and personnel, many links are available to the general user.

Theoretical Computer Science on the Web
http://robotics.stanford.edu/~suresh/theory/theory-home.html

Links to organizations, journals and bibliographies, lecture notes, software, and other online sources relating to theoretical computer science.

Women and Computer Science
www.mills.edu/ACAD_INFO/MCS/SPERTUS/Gender/gender.html

This site contains a collection of articles as well as links to other sites relating to the role of women in the field of computer science.

Women in Mathematics, Computer Science, and Engineering
www.siam.org/world/women.htm

This site, offered by SIAM (the Society for Industrial and Applied Mathematics) offers links to organizations, programs, bibliographies, articles, and discussion lists focusing on women in computer science.

The World Lecture Hall
www.utexas.edu/world/lecture/cs/

The World Lecture Hall provides links to courses offered by various academic institutions in many disciplines, including computer science. Course syllabi, prerequisites, and contact information are provided.

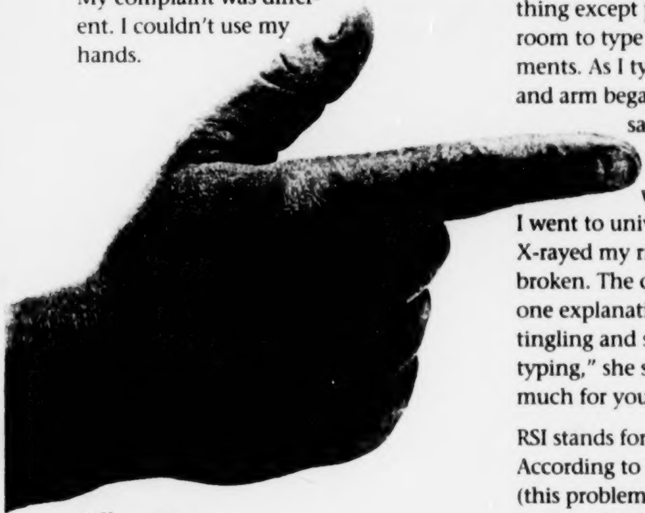
Visit www.jhu.edu/gifted/imagine for links to all Web sites mentioned in this issue.

LOOK, MA, NO HANDS:

LIVING WITH REPETITIVE STRESS INJURY

by Vasugi V. Ganeshananthan

It's not uncommon to hear people say their first semester at college was horrible. "I was homesick." "I hated my roommates." "I couldn't stand the food." "The classes were boring." Not me. Sure, I was a little homesick, but I liked my roommates and my classes; I could even eat the food. My complaint was different. I couldn't use my hands.



Falling Down

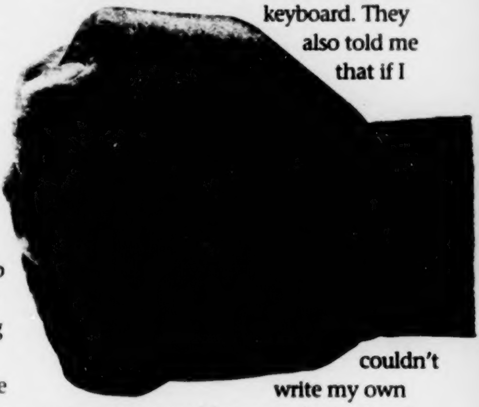
I am a klutz, the type of person who can barely walk without falling. And that was how my problem began—with a fall down the steps of Grays Hall, a dormitory at one end of Harvard Yard. I bounced a couple of times on the way down and landed squarely with all my body weight on my right arm, which was already vulnerable from old sports injuries.

"It's nothing," I told myself, and went to class, where I paid little attention to anything except pain. Then I returned to my room to type up some homework assignments. As I typed, my injured right hand and arm began to give way. I compensated with my left.

Five days later, both hands were hurting and swollen. So I went to university health services. They X-rayed my right arm, but found nothing broken. The doctor could think of only one explanation for why both hands were tingling and swollen. "You have RSI from typing," she said. "You compensated too much for your injury."

RSI stands for repetitive stress injury. According to the brochure she handed me (this problem was so common they had a brochure?), the term covers soft tissue injuries caused by repetitive motions done in certain positions or for too long. RSIs can affect tendons, muscles, ligaments, nerves, and blood flow. "You can't use your hands," she told me. I was stunned.

She fitted me with a sling and two splints, then I was off to the student disability office. They told me how to get scribes for my homework and advised me to purchase voice dictation software and an ergonomic keyboard. They also told me that if I couldn't write my own exams, they would arrange for scribes. I was reeling.



Exams were starting soon, but I had bigger worries with the daily essentials. Within the next few weeks, my hands stiffened. First it hurt to get dressed in the morning. Then it hurt to use utensils. Then I couldn't even lift a sandwich. Homework was excruciating. When I did find scribes, talking through essays was difficult. There was little revision. I had never realized how much I relied on

Continued on page 29

Where the Classrooms Have No Walls

by Molly Richman

Today, my calculus class was held on a hammock. My whole class could fit on the hammock because in my school, the classes are very small—there's just one student in each: me. Incidentally, I'm also the teacher for nearly all of my classes. And my classroom keeps dizzily changing location—one day I'll study calculus in the hammock, another day lying on the sofa, another day sitting at my computer as I work out some equations from a calculus CD. No, my school isn't in the middle of major construction work or a teacher's union strike. I'm homeschooled.

The Only Reason to Study

As I lay there on the hammock, swinging back and forth, my eyes drifting away from "Integration by Parts" up to the infinitely blue sky, I began to reflect on the unique freedom that homeschooling has given me. I thought about how I came to study calculus—I had planned to do pre-calc, but then the wonderful book "What is Calculus About" by W.W. Sawyer caught my eye. As I read it, I became fascinated by the simplicity and logic of calculus. Since homeschooling is largely self-directed, I decided to cover my few remaining pre-calc topics quickly so that I'd be able to begin calculus this year.

I studied calculus slowly. I didn't leave the chapter in my calculus text about integrating trigonometric functions until I had worked through the examples and felt certain that I understood how to find the derivative of cosecant x. Since my grades aren't determined by tests, simply memorizing formulas would have done me no good. For me, the only reason to study anything is to understand it, not to be able to regurgitate information.

Striking a Balance

But don't think that homeschooling is all freedom and no structure. In fact, it's imperative to strike a balance between structure and freedom, and in my house it's my mother who makes sure that my scale doesn't tip in either direction. Over the years, her role in my education has evolved. When I was younger, she sat next to me through almost every sheet of math I studied. Now, I study math on my own—but run to her to explain a new concept or discuss a surprising theorem. Just as important, she counteracts my procrastination. She pushes me to set firm goals for myself, and if I won't, she's very willing to set them for me.

Still, it's easy to slip around a deadline just set by Mom. So we've always used competitions to provide deadlines, and more recently, I've used Advanced Placement Exams to prod myself to learn more, more thoroughly, and in a set amount of time. And, because my parents have organized online AP classes for homeschoolers, two of the AP courses that I took this year even provided classmates and a teacher. Although I've never met most of my classmates face to face, I've had the chance to discuss literature with other book lovers and to argue about Freud with classmates from my AP Psychology class. The biggest advantage of these classes, though, has been that they've forced me to stay on a schedule. If I'd studied American History on my own, I can imagine finding the Civil War so interesting that I'd have studied it for three months—and then I would never have been prepared for the AP Exam in the spring.

BEST COPY AVAILABLE

LUS
Second Edition

The girls in the "math club" that I ran two years ago, at the wild end-of-year party. (l-r) Lucy Dunderdale, Becky Hill, Nellie Dunderdale, Hannah Richman, Elizabeth Paladin, Nora Dunderdale.

Learning by Teaching

I've been homeschooled my entire life. When I was three, I learned to read by looking over my mother's shoulder as she worked on phonics with my older brother. I've always been able to learn from what my brothers and sister are learning—a sort of "trickle-down" education. I watched the videos in my oldest brother's French course, for example, long before I could really understand them, and this gave me a boost when I began to study French myself.

Homeschooling has allowed me to take an active role in my sister's education as well as my own. When I was little, Hannah and I used to have a make-believe school together, I the teacher, she the pupil. But our "school" wasn't all make-believe; I actually taught my sister to read, introduced her to division, and led her in messy, joyful art projects. "Sister School" gave my sister an enriched preschool, and it also made me realize that I love to teach.

I've found chances to teach since then, opportunities that I don't think I would have had if I'd gone to school. For example, I started my own elementary version of the U.S.A. Mathematical Talent Search, a contest I've participated in for years, for my little sister and her homeschooled friends. This mini-USAMTS, which I masked as a math club, gave them new ways to talk about math. Like the USAMTS, my contest didn't have time limits, and, instead of asking for a simple answer (e.g. 297 or 45 degrees), it required the club members to prove why the answer is 297 or 45 degrees. But once again, I learned just as much as they did. I learned how to write math word problems that weren't too difficult or too easy. And I learned how to preserve the spirit of fun in the math contest, how to make it competitive but not discouraging, and how to keep the solutions from six different girls straight.

Selected Homeschooling Resources

The Ultimate Guide to Homeschooling by Debra Bell (Word Books, 1997).

The Homeschooling Book of Answers: The 88 Most Important Questions Answered by Homeschooling's Most Respected Voices edited by Linda Dobson (Prima Publishing, 1998).

Homeschool courses

www.pahomeschoolers.com/courses

If you're a homeschooler interested in taking an online AP course, go here to find course descriptions. Now 14 classes are running, ranging from AP French Language to AP Macro Economics. These courses are open only to homeschooolers, but the courses offered through apex (www.apex. netu.com) are open to all, although more expensive.

For more information about homeschooling, contact the National Homeschool Association: PO Box 327, Webster, NY 14580-0327; (513)772-9580; www.n-h-a.org/

But what is the greatest gift that homeschooling has given me? I think it's that the lines between school and fun have never existed for me; they've always been as intangible as my school's nonexistent walls. I can't really tell people how many hours of schoolwork I do each day, because I really feel that I'm learning all the time. Lately, in my free time, I've been reading Platonic dialogues because I've always been intrigued by them. I posted a pen pal ad on a French Web site, and I've chatted with my new pen pals online (where I was delighted to discover a tidbit of French Internet slang: "c" to replace "c'est," just as we write "u" instead of "you"). This, too, I did in my free time—and not because I'm a workaholic, but because I find reading about Socrates and speaking in French fun.

I said that I'm the teacher for most of my classes, but now I'm not sure that's true. My mother has taught me; Mrs. Staver, my online AP English Literature teacher, has taught me; Mireille and Robert in the French in Action video course have taught me; my little sister has taught me; Plato, Jane Austen, Benjamin Franklin, my 130-acre farm, the 80-year-old lady in my French class at the University of Pittsburgh, and the 13-year-old girl that I tutor have all taught me. So really, my school's classes aren't small; they're enormous. For they're not confined to a classroom. They encompass the world.

***Molly Richman** is a 15-year-old junior and aspiring French major. This year she is taking a third-year French culture class at the University of Pittsburgh.*

BEST COPY AVAILABLE

OFF THE SHELF

by Diane Clavier

Prometheus Bound

A testament to the universal appeal of Greek mythology, Prometheus has stood for 25 centuries as a great symbol of resistance to tyranny. The myth has been told by authors as diverse as the Roman poet Ovid in Metamorphoses and Mary Shelley in *Frankenstein, or the Modern Prometheus*, but the primal energy of this story comes across most vividly in Aeschylus's fifth-century B.C. drama *Prometheus Bound*. This play, although foreign in its style, continues to speak its powerful message of right-versus-might even to 21st-century readers.

Prometheus Bound is set in "the remotest region of the earth." The action begins with the allegorical figures Strength and Violence dragging Prometheus, a member of a race of immortals called Titans, on stage. Hephaestus, the god of fire, enters and chains Prometheus to a rock. This is Prometheus's punishment for thwarting Zeus's attempt to destroy the human race, on whom Prometheus took pity. To save them, Prometheus gave them the gift of fire and knowledge of how to use it, and also tutored them in arts, sciences, and philosophy. This knowledge put mortals on equal footing with the gods, an offense that Zeus could not tolerate.

Prometheus feels betrayed because it was his advice that allowed Zeus to overthrow Kronos and the other Titans and establish the reign of the Olympian gods over creation. Left alone, Prometheus launches into the first of many soliloquies that form the play's core. He rails against Zeus's tyranny and proclaims Zeus's destiny: the Olympian will one day be overthrown by his own offspring.

The bulk of the play takes place in conversations between Prometheus and three visitors. Through these dialogues, we see the full breadth of Prometheus's virtues. First, he refuses the advocacy of his brother Oceanus, the god of the sea. Oceanus wants to apologize to Zeus on Prometheus's behalf, but Prometheus refuses to compromise his convictions just to save himself. Next, he shows compassion for the maiden Io, another victim of Zeus's caprices. Io had been turned into a cow by Zeus's wife, Hera, because Zeus had tried to seduce her. Revealing his sympathy for the weak, Prometheus offers her comfort; he prophesies that she will one day be returned to human form and bear the child who will eventually overthrow Zeus. Finally, he mocks Hermes, Zeus's messenger, by refusing to provide details about Zeus's future downfall and thus continuing to resist the power of arbitrary rule.

In the conversations with his visitors, Prometheus also reveals his main weakness. Like other heroes in Greek tragedy, Prometheus has a tragic flaw that leads to his demise. He is too proud of his ability to resist the power of Zeus. He enjoys boasting about his defiance and prophesying his enemy's destruction. His pride occasionally turns to rage which leads him into further misery by the end of the play. Oceanus predicts his fall: "If in this way you fling out edged and angry speeches, it may be Zeus will hear you; and, for result, your present load of troubles will seem a childish trifle."

A tragic hero must also enter his fate aware of his own part in it, and Prometheus is no exception to this rule. As Hermes, his third visitor reminds him, "You know what is coming; it is neither sudden nor secret. Only your own folly will entangle you." Soon after delivering those lines, Hermes leaves Prometheus to suffer Zeus's revenge—a thunderbolt that seals him in an abyss in the earth.

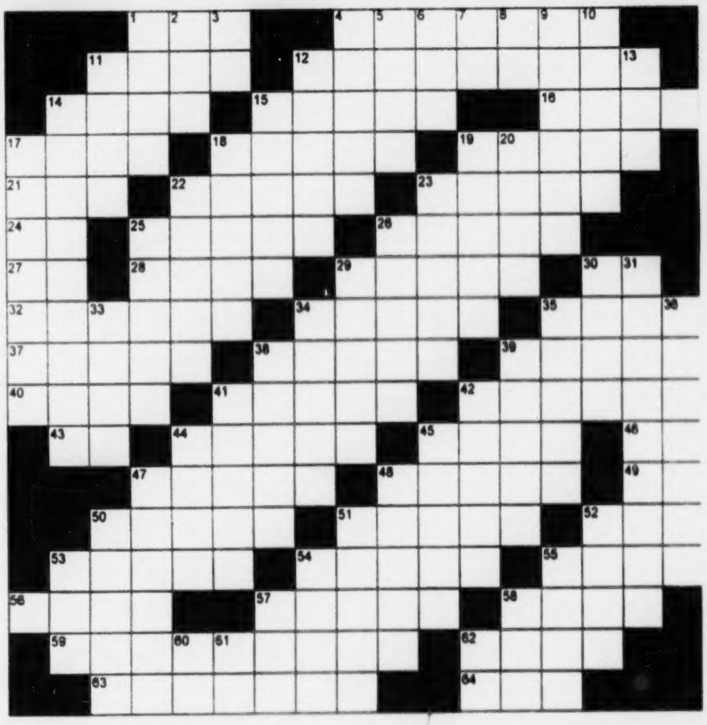
Prometheus Bound does more than celebrate integrity and endurance. It poses a philosophical question about the staying power of brute force. Originally the first play in a trilogy, *Prometheus Bound* sets up a story in which strength and violence triumph for a time, but ultimately give way to reason. In the second play of the trilogy, Zeus frees Prometheus and reconciles with him, confirming Prometheus's belief that "not by strength neither by violence the mighty should be mastered."

Upcoming Book Review

Angela's Ashes by Frank McCourt

Word Wise: Computer Technology

by Carol Blackburn



ACROSS

1 Like a sold out concert
4 Logical operator
11 Electronic junk mail
12 In standard format
14 "__ me up"
15 Change
16 Hematocrit, in ER lingo
17 Supercomputer company
18 11th graders' tests
19 Make __ __ in (2 wds.)
21 Major ISP
22 Kind of data compression algorithm
23 Media
24 South America (abbr.)
25 Coke and Pepsi
26 Xth cranial nerve
27 Storage device
28 Fundamental particle
29 Torvalds' creation
30 Scale note
32 Ancient calculator
34 Funeral hymn
35 In __ (together)
37 __hund ("badger dog")
38 Pull-down features
39 Flora and fauna
40 Last word in a German novel
41 __ of time
42 Memory storage area
43 White House locale
44 Finnish telecom giant
45 Fastened by means of a belt
46 B&O, for one
47 Ice cream holders
48 Small songbirds
49 Half a poodle's name
50 The King
51 Kind of circuit
52 Ms. West
53 First computer
54 Jobs
55 Chest muscles
56 Dream, in Dijon
57 Kind of ware
58 Gopher's cousin
59 Set up a computer
62 Start
63 Repeat
64 Zip

DOWN

1 Neuter
2 Kind of memory
3 Meditative chant
4 Nuts
5 Binary digits
6 Object-oriented requirements (abbr.)
7 Natural logarithm (abbr.)
8 Ireland (abbr.)
9 __ denied
10 G'Kar's people
11 Special ops commando
12 Refinement
13 Illuminated
14 Wide spectrum
15 Kind of tea
17 Domino-effect computer failure
18 Ralph Lauren brand (pl.)
19 Contend
20 Dix ÷ 5
22 Spreadsheet company
23 Spasms
25 Small, fast memory
26 Pernicious program
29 Ms. Tripp
30 Mind your own ... files?
31 Connection
33 Current options
34 Comedian Leary
35 Culls
36 Transmits
38 Creates
39 __ *Norton*
41 Kind of boom
42 Beers, in Berlin
44 New (Lat.)
45 Intel CEO
47 Server's partner
48 First word in Microsoft's slogan
50 French messenger
51 Look
52 __ down (crash)
53 EU's former acronym
54 __ down (terminate)
55 Combine
57 Student Government Assn. (abbr.)
58 C'est __
60 Iron (abbr.)
61 Opposite of UV
62 Barnes & Noble online

Solution on page 29

Exploring Career Options:
Federal Law Enforcement

Interview with Heather Ivy, FBI Special Agent

by Melissa Hartman

When Heather Ivy was in middle school, she and her family moved next door to a Secret Service agent. Heather was fascinated and intrigued—and on her way to a career in federal law enforcement.

After earning her bachelor's degree in sociology and working for three years in sales, Heather began the application process for the Federal Bureau of Investigation. She has been a Special Agent for nearly five years in the Miami Division.

Note: Because of the high level of security necessary in Heather's profession, we are unable to include a photo of her with this interview.

What kinds of cases do you work on?

I work on a squad that investigates health-care fraud, concentrating mainly on the Medicare program. As soon as I reported to Miami, my first and only office so far, I was put directly onto this squad and began working right away on an undercover operation. At the time, the squad was part of a task force that also included representatives from the U.S. Postal Service, the IRS, the Office of the Inspector General, the Office of Health and Human Services, and other agencies. The FBI had purchased a health clinic in South Miami, and we had undercover agents working in the clinic. I worked on that case with about five other agents.

Did you do any of the undercover work?

No, but I was responsible for keeping in contact with the undercover agents. We also had informants, or cooperating witnesses, out on the streets with whom we needed to keep in contact. These cases also involve a lot of paperwork. You have to report every meeting that you have, and most of the meetings were recorded, so you have to put those recordings into evidence. It takes several agents to handle cases like these because there are so many tasks that go into making it successful.

> “The training, which lasts for 16 weeks, is pretty intense. I had an idea of what it would be like from watching The Silence of the Lambs, but when I got there, I was shaking because I was so scared. I asked myself, What am I doing here? Am I really prepared for this?”

Were you the youngest agent on the case?

Yes. I was one of the lucky agents to come right out of the FBI Academy and work a case that had already been in the works for a couple months. It's more typical for new agents to be placed with a senior agent, whom they shadow. Down the road, new agents learn how to work a case and eventually open their own cases.

How long would a new agent work with a senior agent in this "mentorship"?

Technically, new agents are under a two-year probation. But each agent is different in how much mentoring he or she needs. Some agents can pick things up right away, and some agents end up staying with their mentor for a longer time just because they work so well together. Even though I was actively working on a case, I was mentored for about a year. I was very lucky to have a female mentor—of the ten agents on my squad, only three are females.

Why did you decide to work in federal law enforcement, versus local or state?

I think the work can be more demanding and complex on the federal level. I wanted case work. I wanted to get involved in investigations that could last for two or three years.

How did you decide on the FBI in particular?

When I was in middle school, my next-door neighbor was a Secret Service agent. Throughout high school and college, I kept in touch with him. Eventually, with his help, I was able to do an internship at the Secret Service during my senior year in college.

During my internship, I learned about each of the federal law enforcement agencies—not only the Secret Service, but also the ATF, DEA, and FBI. What appealed to me about the FBI is that agents can work on many different kinds of violations. If you get tired of health care fraud, you can work bank robberies. If you get tired of bank robberies, you can work terrorism. If you get tired of that, you can work on a drug squad. I didn't see that range of opportunities in any other agency.

You majored in sociology with a concentration in criminology. Is that kind of background necessary to enter the FBI?

There are several ways to go into the FBI. You can go in with a law degree or an accounting degree, as a language specialist, or as what's called "diversified"—having a four-year degree and three years of work experience in just about any field. They're taking people from a lot of different occupations; now, for example, they're taking a lot of teachers. They've really opened up the doors.

My three years of work experience was in sales, basically because that was the first job I could get out of college. I knew I wanted to go into the FBI, and I knew I needed three years' work experience. I just wanted to get started on those three years so I could do what I really wanted to do.

What does the application process involve?

For me, the process took about a year. After they receive your application, they do a background check, which is very thorough. They interview not only your references, but lots of other people from your past—one of my neighbors from when I was in elementary school was interviewed. They go everywhere and find out every little thing they can about you.

There's also a written exam and a panel interview, where you're in front of four agents who ask you a variety of questions. Unfortunately, all I'm allowed to tell you about those questions is that they're the same for each candidate.

Finally, you go for a polygraph, which was for me the most stressful. I had no idea what kinds of questions I'd be asked. I was nervous, my palms were sweating, and I wondered if those kinds of responses would make the needle go up and down and make it look like I was lying. I've heard that most of the people trying to get into the FBI are disqualified by their polygraph results.

Continued on page 28

Can you tell us about what happens next—at the FBI Academy in Quantico?

The training, which lasts for 16 weeks, is pretty intense. I had an idea of what it would be like from watching *The Silence of the Lambs*, but when I got there, I was shaking because I was so scared. I asked myself, What am I doing here? Am I really prepared for this?

> “Helping people in general makes it worth it. Sometimes I don't even want to leave the office.”

It's a very strict environment. There's a lot of physical training and firearms training. Because I'd never even touched a gun before, the shooting was difficult for me, but I learned to use a 9mm handgun, a shotgun, and a semi-automatic submachine gun. We also spent a lot of time in the classroom and on practicals, where you actually learn how to work cases.

You might have heard of Hogan's Alley, which is a pretend town where we do practicals. People recruited from the town of Quantico, Virginia, come into this little pretend town and role play, which is really neat. The town has a bank, a motel, a bar—everything a typical small town would have. There, we learned how to work such cases as bank robberies and fugitive investigations. Hogan's Alley helps new agents gain experience in those types of cases and learn interviewing skills that are important to our job.

The other thing I really liked about Quantico was the Tactical Emergency Vehicle Operations Center, where you learn to drive—and not like you learn in driver's ed. You wear a helmet and drive fast cars—I think I had a Camaro or a Firebird—on a course where you learn how to do different kinds of maneuvers and car stops.

When did you find out what your first assignment would be?

When you enter Quantico, you submit a wish list, where you rate all of the divisions in terms of where you want to go. Halfway through training, each agent stands in front of the class and opens an envelope containing his or her assignment. We each pinned a little picture of ourselves on a map of the United States to show where we were going. I got my eighth choice, but I was glad to stay on the East Coast. You can end up anywhere in the country.

What about once you're in?

You can be moved anywhere at any time depending on the needs of the Bureau. I went to a retirement party a few days ago for an agent who had worked in seven different offices. But some agents stay in one office for their whole career. It depends on your skills and how the Bureau can best make use of them.

It sounds like this career could be hard on a family or marriage.

I'm married to another agent, and we're assigned to the same office. I think it would be difficult if I weren't married to someone who works in this kind of environment. You need someone who will understand the particular challenges of this kind of work and the kind of schedule it requires. You definitely don't work 9-5.

Can you still have a personal life?

Sure. We like to travel a lot and get away at least once a month and spend time together. We go to dinner and movies with people from the office. And we go to a lot of Gators games at the University of Florida.

But we always have our beepers. On New Year's Eve, we were at a restaurant with another agent when all three of our beepers went off. But you accept that when you hold up your hand and take the oath for this position.

The job must be worth it for you.

I always look at the big picture. When I started working in health care fraud, I thought of the millions of dollars being stolen from Medicare. The other agents and I often discuss how there may not be any Medicare for us when we need it. It's worth it to all of us to stop the people who are ripping off the system.

Helping people in general makes it worth it. I know an agent who worked a kidnapping, nonstop, around Christmas. She said she'll never forget the father's face when he got his child back. It's things like that that make me want to come in here every day. Sometimes I don't even want to leave the office. A lot of people come in here at all hours and on weekends because they really care about what they're doing.

What are your goals for the future?

I'm in the FBI to stay. Down the road, my husband and I would like to start a family. The Bureau now affords dual-agent couples the opportunity to go part-time and raise their families.

I also plan to grow as an agent, work as many cases as I can, and contribute as much as I can. I love what I'm doing.

What final words of advice can you offer to young people interested in joining the FBI?

Get as much background and education as you can. One thing I regret is not getting a law degree. After I started, I realized that I was really interested in the law side of it. Now I have other priorities, so it will probably be several years before I can pursue that.

Young people should start focusing and realizing what they'll be best at. This work really accommodates a variety of personalities. You could be an agent who interacts with lots of different people, or you could work in the lab examining fingerprints and blood samples. That's the great thing about the FBI—there are so many ways to make a difference.

Look, Ma, No Hands—from page 21

physical contact with keyboard or pencil. Some of my work I did on audio tapes. Some I did on voice dictation software. Some I never did. Everything took three times as long; I was rapidly falling behind, and I barely slept.

Soon, my hands began what I call "curling." In a relaxed position, most people's hands are flat. Mine were practically fists. At my worst point, I was on two over-the-counter painkillers—and one prescription muscle relaxant—every day. The muscle relaxant reduced the spasms, but it also made me drowsy. When I went to class, I could either take the medication and try not to fall asleep or go without and agonize rather than pay attention.

I almost left school.

A Slow Recovery

When I was classified as disabled, I was allowed time-and-a-half for exams. This may seem like a lot of time, but I barely finished them. But as the semester progressed, the hours I spent calibrating the voice dictation software taught me how to dictate to a person. I learned to slip in the punctuation without missing a beat. I also learned something important from my first (disastrous) exam. One of the course's teaching assistants was my scribe. I read right and wrong answers into his facial expressions and reactions. It was an added tension I didn't need. If I was especially anxious about a test, I learned to insist that the scribe not be a teaching fellow.

Learning how to cope mentally with reduced activity was also hard. I had to give up tennis and boxing. I wasn't able to lift my tenor saxophone during fall and most of the spring. And, since I was unable to write, I feared that I wouldn't make it onto the staff of the campus newspaper. But with time and the help of teachers, scribes, editors, and friends, I made it through. I was put on band hiatus, with the assurance that I could return at any time. And I got a spot on the newspaper's staff.

Finally, first semester was over, and so were the majority of my problems. I still suffered occasional pain, tingling, and swelling. I had all my tests scribed—there was no way I could write with a pencil for very long—but I typed my own papers. The difference now was that I knew when to stop. Instant messaging and long e-mails were pretty much out. My phone bill was skyrocketing. But I was surviving. I even rejoined the band.

Now it looks like my hands might be permanently puffy. When I was at home for summer, I went to a hand specialist. He X-rayed my right hand and discovered that underneath all the RSI was another, underlying problem. In falling down the steps of Grays, I had partially torn a ligament. It isn't bad enough for surgery, and there isn't much I can do but wear my new splint (another one!) and wait.

It doesn't take a fall to get RSI. The root of the problem is usually typing—too much, the wrong way, without breaks, or on equipment that's too large or small. Today's students are highly prone to RSI. With papers, homework, compulsive e-mail checking, instant messaging, and surfing the Web, you can injure yourself without noticing. Yet computer knowledge has become indispensable. So if it's bad enough, an RSI can keep you from succeeding in college and beyond. It's important to know when to slow yourself down so you can type and write when your future depends on it.

***Vasugi V. Ganeshananthan** is a sophomore English concentrator at Harvard University, where she is a reporter on The Harvard Crimson and plays tenor saxophone in the Sunday Night Jazz Band.*

Selected Resources

Computer-Related Syndrome: The Prevention and Treatment of Computer-Related Injuries by Richard Dean Smith, Steve T. Garske, and Steven T. Garske (Prometheus Books, 1997).

Conquering Carpal Tunnel Syndrome and Other Repetitive Strain Injuries by Sharon J. Butler (New Harbinger Publications, 1996).

Repetitive Strain Injury: A Computer User's Guide by Emil Pascarelli and Deborah Quilter (John Wiley & Sons, 1994).

Related Web Sites

Harvard RSI Action
www.eecs.harvard.edu/rsi/

Carnegie Mellon RSI
Web site
www.cmu.edu/rsi

UC–Berkeley Web site
www.uhs.berkeley.edu (use key words "repetitive stress injury")

RSI Recovery Page
home.clara.net/ruegg/signs.htm

Solution to Word Wise

■	■	■	S	R	O	■	■	B	O	O	L	E	A	N	■	■
■	■	S	P	A	M	■	C	A	N	O	N	I	C	A	L	■
■	B	E	A	M	■	A	L	T	E	R	■	■	C	R	I	T
C	R	A	Y	■	P	S	A	T	S	■	A	D	E	N	T	■
A	O	L	■	L	O	S	S	Y	■	P	R	E	S	S	■	■
S	A	■	C	O	L	A	S	■	V	A	G	U	S	■	■	■
C	D	■	A	T	O	M	■	L	I	N	U	X	■	M	I	■
A	B	A	C	U	S	■	D	I	R	G	E	■	S	Y	N	C
D	A	C	H	S	■	M	E	N	U	S	■	B	I	O	T	A
E	N	D	E	■	S	A	N	D	S	■	B	U	F	F	E	R
■	D	C	■	N	O	K	I	A	■	G	I	R	T	■	R	R
■	■	■	C	O	N	E	S	■	W	R	E	N	S	■	F	I
■	■	E	L	V	I	S	■	S	H	O	R	T	■	M	A	E
■	E	N	I	A	C	■	S	T	E	V	E	■	P	E	C	S
R	E	V	E	■	■	S	H	A	R	E	■	M	O	L	E	■
■	C	O	N	F	I	G	U	R	E	■	B	O	O	T	■	■
■	■	I	T	E	R	A	T	E	■	■	N	I	L	■	■	■

Planning Ahead for College

by Linda E. Brody, Ed.D.

Are you overwhelmed about how to begin your college search? Getting information about colleges used to be a daunting task that involved writing to individual colleges for information or sitting in a library viewing catalogs. Even then, information was often spotty.

Today, with the click of a mouse, you can take a virtual tour of colleges around the country on the Internet. You can view pictures of college campuses, review course offerings and faculty qualifications, and learn about student life. You can even apply online. In addition to Web sites developed by individual colleges, a host of organizational and commercial sites have been developed to help college applicants.

This article spotlights some particularly helpful Web sites that make choosing and applying to college much easier.

Accessing College Information on the Internet

College Web Sites

There's no substitute for seeing a college in person, and you should not make your final choice without a visit. But personal visits to a variety of schools are costly and time-consuming. It's wise to narrow your search first, and the Internet can help.

Perhaps you're considering Colgate University in Hamilton, New York, but it's a long trip to make without knowing more about the university's offerings. So check out Colgate's Web site, www.colgate.edu, which opens with a beautiful picture of the campus. By clicking on Admissions, you can take a virtual tour of the campus with more pictures and descriptions of what makes Colgate unique.

Do you want to major in philosophy and need to know what Colgate offers in this area? Click Academics and go to the Philosophy and Religion page, where you can view a list of the course offerings in this department and learn about the faculty. Do you want to play intramural sports, or join a theater group or a religious organization? You can check out Colgate's student activities. Do you need financial aid? Colgate's Web site describes their financial aid policy and provides links to the U.S. Department of Education and the College Scholarship Service. Ready to visit? Travel directions are provided. Ready to apply? There's a direct link to the Common Application, which Colgate uses.

The popularity of Internet college searching has led colleges to put as much information online as possible. Clearly, some colleges have more detailed sites than others, but most are updating and improving their sites regularly. Some colleges even publish the college newspaper online — giving you a real insider's view of life on campus.

Like Colgate, most colleges and universities have a URL that's easy to guess. If your guess doesn't work, access *www.embark.com*, which includes an alphabetical list of college Web sites.

College Search Services

College search programs, available online, allow you to input the criteria that are important to you (e.g., size of school, location, choice of major, activities, cost). They then output a list of colleges with the characteristics you have specified. As all colleges may not be included in all databases, it's wise not to use them exclusively; however, they can be useful tools to identify colleges that you may not otherwise have selected.

Consider the student who is interested in majoring in philosophy at Colgate. Using an online college search service to look for selective colleges in rural areas in the northeast with the option of majoring in philosophy yields Colgate, but also Williams College in Massachusetts, which the prospective candidate may want to consider.

Web sites that offer free college search services include:

www.embark.com
www.collegeboard.org
www.collegenet.com
www.collegeview.com
www.petersons.com

College Rankings

Like the college search services, lists of highly ranked schools may prompt you to consider a college that you might otherwise have overlooked. For example, if you know you want to major in engineering, a list of colleges with top engineering departments may include several that you hadn't considered. Be cautious about placing too much emphasis on how a college is ranked because the criteria may lack objectivity or may not include what is important to you. But, as you begin your college search, lists of highly ranked schools can be one more helpful resource.

Among the rankings of colleges now available online is the annual list reported by *U.S. News*

and World Report. See:
www.usnews.com/usnews/edu/college/corank.htm

Standardized Tests

As a college applicant, you will need to take standardized tests such as the SATI or ACT. You may also need achievement tests such as SATII or Advanced Placement tests. If you're looking for information about these tests, including when and where you can take them, check out the Web sites of the College Board and ACT. You can even register online. See:

www.collegeboard.org
www.act.org

Commercial companies that try to help students improve their scores are also now marketing on the Internet. For example, see:

www.review.com (Princeton Review)
www.kaplan.com (Kaplan now offers its prep course online)

Financial Aid Information

If anything is more overwhelming than choosing a college, it's trying to locate financial aid . Again, the Internet can help.

One of the best sites is *www.finaid.org*, which identifies numerous opportunities for financial aid including scholarships, fellowships, and loans.

Another useful site, *www.fastweb.com*, will email you information about scholarships for which you qualify.

Federal grants, loans, and work-study require you to complete the Free Application for Student Aid (FAFSA) form. This can now be completed online or downloaded from your computer by accessing *www.fafsa.ed.gov*.

Other helpful sites for information about financial aid include:

www.collegeboard.org
www.collegeview.org
www.salliemae.com
www.nasfaa.org

When it's Time to Apply

Many options now exist to make the application process easier as well. Most college Web sites now include the application, which saves you the trouble of writing for a copy. Some colleges let you submit it online; others allow it to be downloaded so that you can mail it with other supporting materials.

The Common Application is now accepted by 195 colleges. If your list includes some of these schools, you can access and complete the Common Application online at:

www.commonapp.org.

Sites such as *www.collegeboard.org*, *www.applyweb.com*, and *www.embark.com* allow you to complete several applications online without having to retype the background information common to all of them. Thus, your name, address, phone number, and similar information will carry over to subsequent applications, so you will have to type only the additional information that is required by particular schools.

For college applicants, the Internet is an incredible source of information that can make the college search, selection, and application process much easier. Take full advantage of this tool that is literally at your fingertips. But also be sure to make a personal visit before making a final decision about where to spend your undergraduate years.

Selected Multi-Purpose Sites

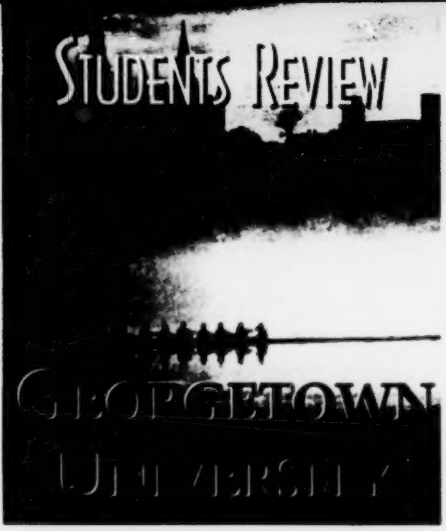
www.collegeboard.org
At this site, you can search for colleges and scholarships, and create an account for online applications. This eliminates the need to continually re-type basic information, and allows you to work on applications over several sessions. You can also get information on test preparation (SAT, PSAT, ACT, AP, CLEP), including sample questions and online registration.

www.petersons.com
At this site, you can create a free account to keep track of those schools you're interested in, along with their application deadlines. You can also search for scholarships, apply online, and buy test preparation software. In addition, this site contains databases of study abroad programs, distance learning opportunities, summer camps, programs, jobs, and internships.

www.embark.com
Create a free account to use when searching for colleges and scholarships and applying online. You enter basic information once; it will then be filled in automatically when necessary. This site also has sections devoted to test preparation (including sample questions, practice tests, and test-taking tips) and to online/distance learning opportunities.

www.collegenet.com
Both college and scholarship searches are available at this site. CollegeNet is also home to the CollegeBOT Crawler, a search engine dedicated solely to education-related Web sites.

www.campustours.com
This site contains links to colleges' virtual tours, videos, and webcams. It also has links to sites dealing with financial aid, college searches, and college life.



Students Review Georgetown University

The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.

Our reviewers include 14 students, who major(ed) in biology (1), business administration (1), economics (3), English (2), government (3), international business (1), international economics (1), international history (1), international politics (1), nursing (1), philosophy (1), and psychology (1). (The number of majors exceeds 14 because some students have double majors.) Students' comments appear within quotation marks.

Quality of Academic Instruction for Undergraduates

Georgetown University includes not only a College of Liberal Arts but also undergraduate schools of Business, Foreign Service, and Nursing. The School of Foreign Service (SFS), the oldest and largest such school in the world, offers an unusual undergraduate education for students interested in international careers in either the public or the private sectors. All our reviewers were very enthusiastic about the education GU offers.

"I found the professors to be extremely available and interested not only in what I thought about class, but in my life in general. I developed strong relationships with many of my professors while at GU and plan to keep in touch with them in the years ahead."

"Most students, particularly those in the SFS and the Business School, spend most of their first two years taking required courses. In addition to demonstrating mastery of a foreign language, all GU students must complete two courses each in history, philosophy, theology, literature and writing, social science, and math/science. SFS students must also study political theory, international relations, four semesters of economics, four of history, and specific courses like The Map of the Modern World. The immediate effect of all these requirements is certainly a bit of disgruntlement among students who think they are smart enough to figure out what they need to learn. However, by the end of sophomore year, most complainers turn into the core's biggest supporters."

"The highly integrated core offers students an extensive and diverse knowledge base in the liberal arts and social sciences. The core is the strong backbone of a Georgetown education and is, in my opinion, the absolute strength of GU. I would never have studied economics or theology had I not been forced to do so, and today I am profoundly grateful I was. I spent last year studying abroad with Ivy League students, all of whom were really smart and knew a lot about their majors, but not a lot about other subjects. I'm a government major, yet I was able to have intellectual conversations with history, theology, and economics majors, while they had almost no common intellectual ground with each other."

"The SFS's core curriculum is rigorous, with few elective slots in the first two years. However, AP credits in history or English can cut down on required courses. The GU library is very helpful; and being in Washington, we also have access to the Library of Congress, which is phenomenal."

"Class size varies depending on the department and the level of the course. Government, being by far the most studied field at GU, has some introductory courses with 30 or 40 students in them. However, even intro classes in most other subjects tend to be smaller. Certainly by late sophomore year, most students are in small classes. Also, classes in the College tend to be smaller than those in the SFS because many SFS students take the same courses in the same sequence (although we're not required to do so)."

"Grading at GU has not been spared the recent wave of grade inflation. Currently, the average GPA is 3.2. If you put in a decent amount of effort and attend class regularly, a *B* is not too hard to score. *A*s are harder to come by and *C*s are for those who put in very little effort."

Social Life

"Georgetown's location can't be beat. We have all the advantages of a city (cultural events, museums, internship opportunities, etc.) without the negatives (destruction of campus social life). The GU campus is located in the historic community of Georgetown and is a five-minute walk from one of Washington's nicest commercial areas. Safe and attractive, yet within Washington's city limits, GU's setting couldn't be better."

"From our location high above the Potomac River, we look out on the Washington Monument, the Lincoln and Jefferson Memorials, and the Kennedy Center. The campus itself is beautiful, with historic as well as modern architecture and lots of open space and outdoor benches and pavilions."

"Housing is designed to make it easy to meet people. All freshmen are housed in three dorms that are quite close together. The spacious upperclass apartments are also conveniently located on campus. Friends are always stopping by on their way to dinner or back from class."

"The university is saturated with student organizations. Whatever your interests, whether they be politics, journalism, religion, theater, music, dance, or sports, you can probably find an existing club that meets your needs. If on-campus clubs don't interest you, perhaps something in Washington will. Within a ten-minute walk, the heart of Georgetown offers restaurants, night clubs, movie theaters, shops, art galleries, and much, much more. The Kennedy Center, Washington's premier performing arts center, is fifteen minutes away. The Smithsonian Institute is twenty minutes away on foot, and even closer if you ride the subway. You can spend an afternoon on the steps of the Lincoln Memorial reading your philosophy assignment, then dance the night away at a popular nightclub. Four years is simply not enough time to enjoy all of the attractions that GU and Washington have to offer."

"GU students are certainly driven academically, but almost everyone works equally hard at whatever they choose to do outside of class. The student body is quite diverse in its interests, though there does tend to be an abnormally large concentration of students who are interested in politics. (If another GU alumnus doesn't follow Clinton to the White House, it won't be for lack of trying!) GU has no fraternities which, in my opinion, is an extremely positive attribute. By not fostering exclusionary groups, GU allows you to meet people from all over the country and the world without having to endure hazing."

What Do You Like Best about Georgetown?

"The feeling that you're at the epicenter of events that are shaping America. Some member of the GU community is always being featured prominently in the news. Whether it's seeing a clip from a speech made on campus by a prominent political figure or watching one of my professors commenting on the day's events on a nightly news program, I feel very engaged in what is going on in the political world. Last year I had conversations with three current ambassadors. Where else could I have done that? Sharing this excitement with an amazing group of students, many of whom have family backgrounds in the world of politics, further enhances this experience."

"Where do I begin? My professors have been extremely knowledgeable, supportive, and caring. The friendships I've made have also been wonderful. I love the size of the student body—not so large that you feel lost, yet big enough to include a truly diverse student body. And I can't praise GU without mentioning the campus. I fell in love with it the instant I saw it and have yet to lose that awestruck feeling."

"I met great people, learned new concepts and ideas, was able to dive into anything that interested me, and had a great time doing it all. I could be myself at GU, yet at the same time, the people I met played a big part in helping me become a better person than I was before."

What Do You Like Least about Georgetown?

"Having to say no to incredible opportunities because of GU's demanding academic requirements. A lot of students are forced to make difficult decisions—like whether or not to accept that internship in a Senator's office, or to join the jazz band—knowing that getting involved can bring with it the cost of poorer academic performance."

"Sometimes the inflexibility of the SFS's curriculum was very frustrating, but in the end I was able to make ends meet. And speaking of making ends meet, GU's financial aid is not the best among its institutional peer group."

"The two things GU really lacks are a strong fine arts and a strong science department. Although there is an orchestra, jazz band, choir, drama society and other activities, GU lacks important resources for fine arts majors. The same is true for the sciences. However, there are plans to remedy both situations in a few years by creating a new science center and fine arts center."

GEORGETOWN UNIVERSITY

Washington, DC 20057
202-687-3600

- 4-year private coed university
- Historic Campus overlooking the Potomac River
- Full-time undergraduate enrollment 1999-2000: 2,837 men; 3,339 women.
- Special features: Founded in 1789, GU is the nation's oldest Catholic institution of higher learning. Founded in 1919, the SFS is the oldest and largest school of international relations in the world. It includes a Science, Technology, and International Affairs track for students interested in political, economic, environmental, health, and security issues pertaining to science and technology in our global society.

Who Would Be Most Compatible with the Academic and Social Atmosphere at Georgetown?

"Someone who wants to be part of a truly international community. Georgetown students hail from all 50 states and over 100 countries around the world. Not a day went by in which I did not hear at least five different languages spoken in class or in the halls."

"First and foremost, academically motivated students. Secondly, self-starters—independent students who know what they want and are prepared to work hard to achieve it. Third, people who can balance studying with having fun. Well-rounded people seem to be the rule rather than the exception at Georgetown."

"People who want to have an impact on society. That is not to say that other universities do not also have students who will make a difference; but there is something unique about students who graduate from GU."

If You Had It to Do over Again, Would You Go to Georgetown?

All reviewers enthusiastically said yes.

"Absolutely. I've studied in Europe and have traveled all over the world. I've been to many exotic places, places of wonder and magic; and the more places I visit, the more I become convinced that GU is the greatest place on the face of the earth. I love the environment, the students, the professors, the campus, the housing, the basketball team, and the city of Washington, D.C."

"In a heartbeat! I'm receiving a great education in government, history, economics, and theology. I feel so knowledgeable now when I pick up a newspaper. The professors are superior and the location glorious. And I feel so comfortable here. What more could I ask for?"

"Absolutely. I cannot imagine a better college experience. It is not just a school people attend to get a 'Georgetown' degree, though none of us denies how valuable that will be in life. People come here and fall in love with the place."

"Definitely. I might change a few classes or professors, but wouldn't exchange my time at Georgetown for any other school."

As you try to find the college or university best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or CTY.

THE COACH'S CORNER

MATHCOUNTS and "Impossible Problems"

by Nick Díaz

MATHCOUNTS is an exciting national competition program designed to stimulate 7th and 8th grade students' interest and achievement in mathematics. Students attend coaching sessions throughout the year to prepare for the competition component of the program. At the school-level competition, four students are selected to compete as teams and individuals in local meets in February. Winning teams and individuals progress to state contests in March. The top four scorers in each state competition then represent their state at the National Finals in Washington, DC, in May. For more information about MATHCOUNTS, visit www.mathcounts.org or call (703) 684-2828.

In all my years of coaching MATHCOUNTS, I've been exposed to many an "impossible" problem that can be solved by studying the pattern involved. Some people seem to have an innate ability to notice, recognize, and apply such patterns to solve given problems. Most people, however, must be taught these skills. And that's where I come in.

Consider this MATHCOUNTS problem: What is the units digit in the expression 1997^{1998}?

How on earth can anyone be expected to multiply 1997 by 1997, just once, let alone 1998 times, and arrive at the answer in less than one minute? Impossible, isn't it? Not really! One problem-solving technique that I stress with my mathletes is "Start small, then work your way up." Let's do just that: start small.

Let's multiply 1997 by 1997. Where do we start? By multiplying 7 by 7, which equals 49. What about the other three digits—1 and 9 and 9? Since all we need is the units digit, then the 1 and 9 and 9 are simply distracters, totally unnecessary information. So, let's concentrate on the following pattern:

- $7^2 = 4\underline{9}$. Units digit is 9. What about the 4 in 49? That's yet another distracting element, since what we want is only the units digit.
- $7^3 = 34\underline{3}$. Units digit is $\underline{3}$. The 3 and the 4 are distracters.
- $7^4 = 240\underline{1}$..Units digit is $\underline{1}$. The first 3 digits? Ignore them.
- $7^5 = 1680\underline{7}$. Units digit is $\underline{7}$.
- $7^6 = 11764\underline{9}$. Units digit is $\underline{9}$.
- $7^7 = 82354\underline{3}$. Units digit is $\underline{3}$.
- $7^8 = 576480\underline{1}$. Units digit is $\underline{1}$.

Now let's put it together in a more compact manner:

$7^1 = 7$, so it obviously ends in 7.

$7^2 = 49$, so it obviously ends in 9.

7^3 ends in 3

7^4 ends in 1

7^5 ends in 7

7^6 ends in 9

7^7 ends in 3

7^8 ends in 1

By now you have probably figured out that 7^9 ends in 7, 7^{10} ends in 9, 7^{11} ends in 3, and 7^{12} ends in 1. The units digit in 7^x must, therefore, be one of only four digits: 7, 9, 3, and 1. It is impossible for 7^x to end in any other digit than these four, regardless of what positive value x may have.

The repeating block is the four digits 7, 9, 3, and 1, in that order. So, what is the units digit in 1997^{1998}? Since these are grouped in sets of fours, then let's divide the exponent, 1998, by 4:

$$1998/4 = 499.5$$

... which means that there will be 499 complete groupings of "7, 9, 3, 1." The .5, however, tells us that we have a remainder in this division; this remainder is 2, as .5 equals 2/4. So, if we go back to the pattern "7, 9, 3, 1", the remainder of 2 tells us that the units digit of 1997^{1998} will be the second number in the pattern, the number 9. So, the answer to this problem, the units digit in 1997^{1998}, is 9, because 9 is the second number in the pattern "7, 9, 3, 1."

What if the base and the exponent are reversed, as in 1998^{1997}? In that case, let's throw away the distracters and concentrate on the 8, the units digit of the base:

$8^1 = 8$ $8^2 = 4$ $8^3 = 2$

$8^4 = 6$ $8^5 = 8$ $8^6 = 4$

$8^7 = 2$ $8^8 = 6$

Again, there's a pattern: 8^x will have 8, 4, 2, or 6 as the units digit, regardless of

(continued)▸

***Nick Díaz**, who has been teaching math for 27 years in Frederick County (MD) public schools, is now in his 19th year at Gov. Thomas Johnson Middle School in Frederick. Since 1985 Mr. Díaz has been coaching T.J. Middle to successes at the chapter, state, and national levels. In 1995 Mr. Díaz was selected the Washington Post Agnes B. Meyer Outstanding Teacher for Frederick County. When not teaching and coaching, Mr. Díaz enjoys motorcycle touring and singing tenor.*

Creative Minds Imagine

Things That Are Said

by Lisa Chan

Tomorrow was the long-awaited event: the student council elections. For the past week and a half I had been wearing a mask. I smiled as wide and falsely as a clown, and sent out "Vote for Lisa!" e-mails to everyone at school. But nothing special in my campaign made me stand out from the other candidates; there was nothing people would remember. So with only one more day, I was desperate. I suppose that is what drove me to make the flyers.

That day I carried my brown-bag lunch in one hand and a stack of multicolored flyers in the other. "Simple yet elegant," I thought, as I carefully looked them over. The black double-lined frame around the simple black type made them look serious and professional. I checked them again. No spelling mistakes, no printing errors. They were perfect.

At the very top, the eye-catcher of the whole page, stood a quote that I had read somewhere: *It's not the mean things that are said that make a difference, it's the things that are never said.* I felt so proud of myself for remembering this perfect quote. Under these words I had written *Speak Your Mind. Vote Lisa Chan for Representative.*

As I entered the cafeteria, I slowly scanned the tables, looking for the perfect group of students to test my flyers on. My eyes eventually stopped at a group of five guys playing cards. Calmly, I asked them to vote for me and then thrust out the first of my flyers.

They skimmed the words quickly as I waited anxiously for their reactions. I shifted from one foot to the other and twisted my lunch bag countless times. They chuckled. Then they laughed—and continued laughing like a pack of hyenas. They asked me, "What does the quote mean?" "Where did you come up with such a stupid idea?" and, worst of all, one of them said, "I'll vote for you, but only if you take back your flyers!" Covering up how hurt I was by laughing with them, I collected the remaining flyers, spun around, and practically ran to my friends for comfort. I gripped my lunch tightly out of humiliation and, worse, disappointment.

The rest of that lunch period, everything moved in slow motion. Those boys ripped my flyers to shreds and wrote in bright ink the names of other candidates and even the names of non-candidates. As if that wasn't enough, they taped the damaged flyers to their lunch table for everyone to see. That was as much as I could bear. As my friends looked on, I left that group of laughing boys behind me and ran.

I didn't know where I was running; I just ran. I hadn't cried in school since fourth grade and I certainly wasn't going to start now. The tears came to my eyes, but I didn't cry. I would never give those boys the satisfaction.

I thought about the quote I had written on the flyers. But the truth is, the mean things people say do hurt. Until that day, I hadn't realized how cruel people can be. I remember thinking that even if I did win the election, I had lost my belief that the world is a kind and caring place. I had lost.

__Lisa Chan__ is a sophomore at the Academy for the Advancement of Science and Technology in Hackensack, NJ. A member of AAST's debate and math teams, Lisa hopes someday to write her autobiography.

Coach's Corner—continued from page 34

how large the positive exponent may be. 1998^{1997}? Easy:

$$1997/4 = 499.25$$

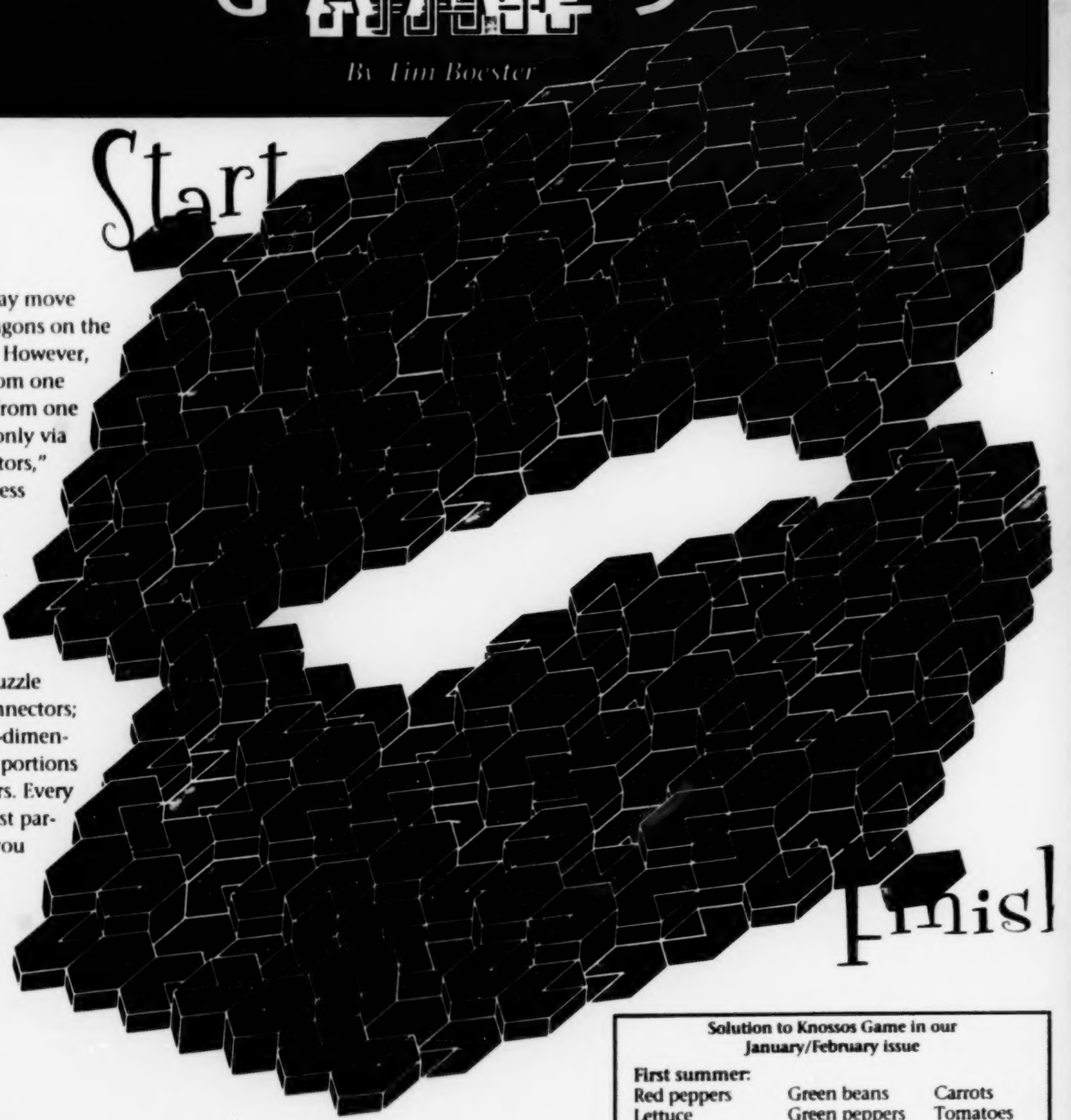
which means the remainder is 1, as .25 equals 1/4. We aren't really interested in the 499, which is the number of blocks of "8, 4, 2, 6" contained in 1997. What we want is the remainder, which points to the number in the pattern "8, 4, 2, 6" that will be the units digit. Since the remainder is 1, then 1998^{1997} will end in 8, since 8 is the first digit in the pattern "8, 4, 2, 6."

Are there other digits where this pattern of four exists? Try it yourself for numbers 2 and 3. Notice any similarities to the patterns of 8 and 7?

What about the other digits? What is the units digit in 1996^{1999}? What about 1999^{1996}? Are these units digits predictable in their own way? I'll leave that to you. These are the kinds of discoveries that will allow you to attack problems of a similar nature, the so-called "impossible" problems, with the assurance that they are doable and indeed quite possible.

KNOSSOS GAMES

By Tim Boester



The Rules: You may move freely among hexagons on the same level (color). However, you may move from one level to the next (from one color to another) only via the black "connectors," which provide access between adjacent levels. There is no direct access between the highest (green) and the lowest (red) levels. The puzzle has no hidden connectors; however, its three-dimensionality obscures portions of some connectors. Every connector is at least partially visible, but you may have to look carefully to see it.

Solution to Knossos Game in our January/February issue

First summer:		
Red peppers	Green beans	Carrots
Lettuce	Green peppers	Tomatoes
Broccoli	Corn	Yellow beans
Second summer:		
Broccoli	Tomatoes	Yellow beans
Green beans	Lettuce	Red peppers
Corn	Green peppers	Carrots

A graduate student in educational psychology at the University of Wisconsin, ***Tim Boester*** *now has additional puzzles on his home page: homepage.mac.com/boester/*

Published by the
Johns Hopkins University
Center for Talented
Youth

Imagine...

OPPORTUNITIES AND RESOURCES FOR ACADEMICALLY TALENTED YOUTH

May/June 2000

Focus on the Social Sciences

On the Trail with the Disease Detectives

Interview with Frank McCourt

Students Review Johns Hopkins University

TABLE of CONTEN

Features

4 **Windows On Our World**

What are the social sciences, and why should they matter to you? Here's a brief look at how this discipline has shaped our lives.

5 **Understanding Society, Understanding Ourselves: The Social Sciences**

What exactly does a social scientist do? Six graduate students in fields ranging from anthropology to psychology describe their research.

9 **What History Means to Me**

Sarah E. Lee's grand-prize winning entry in the 2000 "What History Means to Me" essay contest.

10 **The Fed Challenge: Wearing Alan Greenspan's Shoes**

At this national economics contest, the competition is intense and the rewards are even greater.

12 **Close-Up and Personal**

History and government come to life for students who participate in the Close-Up Foundation's programs in Washington, D.C.

14 **Selected Opportunities and Resources in the Social Sciences**

Academic competitions, summer programs, Web sites, and more.

17 **Sending Secret Messages, 21st-Century Style: The 2000 Intel Science Talent Search**

A profile of Viviana Risca's first-place project in this year's STS.

18 **Liar, Liar**

STS finalist Stefan Block describes his research on teen deception and his experience at this year's Science Talent Search.

19 **The Science of People**

After taking CTY's psychology course, Laura Vernikoff embarked on a research project that taught her even more about how the human mind works.

20 **Shock Me! Fascinating Findings of Psychological Research**

Some surprising examples from research in diverse areas of psychology.

22 **Before and After Angela's Ashes: Interview with Frank McCourt**

Last year, when he was in ninth grade, Jonas Budris interviewed the author as he was finishing the sequel to *Angela's Ashes*.

Departments

24 **Off the Shelf**

Review of *Angela's Ashes* by high school senior Christian Stayner

25 **Word Wise**

26 **Exploring Career Options**

Interview with Donald Henderson, former Dean of the Johns Hopkins School of Public Health

30 **Planning Ahead for College**

Advice for college-bound students who are gifted and have learning disabilities

32 **Students Review Johns Hopkins University**

34 **The Coach's Corner**

35 **Creative Minds Imagine**

Poems by Kathleen Bachynski

36 **Knossos Games**

ImaGiNe...

*Opportunities and Resources for Academically Talented Youth**

ISSN 1071-605X
Volume 7 • Number 5
May/June 2000

Copyright © 2000 by The Johns Hopkins University.

*A trademark of The Johns Hopkins University.

All rights reserved. No portion of this journal may be reproduced by any process or technique without the formal consent of the Johns Hopkins University Center for Talented Youth.

JOHNS HOPKINS
UNIVERSITY

Center for Talented Youth

Published five times a year—September/October, November/December, January/February, March/April, and May/June.

Periodicals Postage paid at Baltimore, MD, and additional mailing offices.

POSTMASTER: Send address changes to Imagine, P.O. Box 3073, Langhorne, PA 19047.

Imagine is published by the Study of Exceptional Talent (SET) at the Johns Hopkins Center for Talented Youth. This publication is an outgrowth of newsletters and programs that, for twenty-five years, have served highly talented students identified by the Study of Mathematically Precocious Youth and by SET.

Editor • Melissa E. Hartman
Assistant Editor • Laura Orem
SET Director • Linda E. Brody, Ed.D.
Research Associate • Carol C. Blackburn, Ph.D.
Editorial Assistant • Mary Parker
Editorial Assistant • Rachelle Lipschultz
Designer • Delta Graphics & Communications

Annual subscription: $25.00
Institutions: $30.00

Address subscription inquiries to:
Imagine
P.O. Box 3073
Langhorne, PA 19047
(215) 826-0707 • fax: (215) 788-6887

Address editorial correspondence to:
Melissa E. Hartman
SET/CTY
The Johns Hopkins University
3400 North Charles Street
Baltimore, Maryland 21218
(410) 516-0309 • fax: (410) 516-0108
email: mhartman@jhu.edu
Web site: www.jhu.edu/gifted/imagine

Announcements

Don't miss any of next year's exciting issues ...

Renew now!

You don't have to wait to hear from us. You don't even have to wait until your subscription expires. You can renew your subscription anytime by calling (215) 826-0707 or by visiting our Web site at www.jhu.edu/gifted/imagine

2000-2001 Focus Topics

Sept./Oct. 2000: Marine Science
Nov./Dec. 2000: Anthropology & Archaeology
Jan./Feb. 2001: Summer Activities
Mar./Apr. 2001: Medicine & Health Sciences
May/June 2001: The Web

Last call for Imagine Readers Panel!

We want *Imagine* to be your magazine, and that's why we're forming the *Imagine* Readers Panel. Tell us what you think of each new issue. Give us your ideas for topics to cover. Help make *Imagine* the best magazine for teens like you!

To become a member of our Readers Panel, tell us about yourself in a paragraph. Be sure to include your age and grade. We'll choose 6-10 readers, whose names will appear in our masthead during the 2000-2001 volume year. Mail your paragraph to Melissa Hartman, SET/CTY, 3400 N. Charles Street, Baltimore, MD 21218 or send an e-mail to mhartman@jhu.edu

Back issues on sale for a limited time!

Catch up on back issues of *Imagine* at incredible savings! Visit our Web site at www.jhu.edu/gifted/imagine or call (410) 516-0309 for prices and to place your order. (Each issue's college review is listed in parentheses.)

1998-1999 (Volume 6)
Environmental Science (Pomona)
The Performing Arts (Emory)
Cross-Cultural Studies (Case Western Reserve)
Career Discovery (College of William & Mary)

1997-1998 (Volume 5)
Literature, Language, & Linguistics (Harvey Mudd)
Public Service & Politics (U of Virginia)
Mathematical Pursuits (Williams)
Multimedia Communications (Northwestern)

1996-1997 (Volume 4)
Planning Ahead for College (Caltech)
Physics & Astronomy (U of Chicago)
Our Global Society (Dartmouth)
Computer Technology (U of Pennsylvania)

1995-1996 (Volume 3)
Home Schooling (Harvard)
Distance Learning (Rice)
Developing Talent in the Arts (UC-Berkeley)
Magnet Schools and Early College Entrance (Swarthmore)
Pursuing Writing Opportunities (Carnegie Mellon)

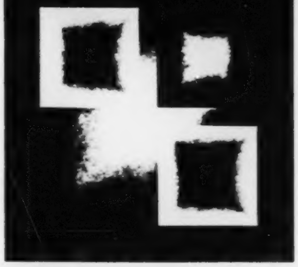
1994-1995 (Volume 2)
Humanities Competitions (University of Michigan)
Science & Technology (Columbia)
Foreign Languages & Study Abroad (MIT)

Visit our Web site at www.jhu.edu/gifted/imagine

BEST COPY AVAILABLE

Windows on Our World

by Carol Blackburn



You may never have studied psychology, yet its vocabulary is already part of your life. Terms such as "positive reinforcement," "delayed gratification," and "neurotic" have entered our lexicon through psychology. And even if you've never taken sociology or economics, they too are already part of the way you see the world, in concepts from peer pressure to materialism to public opinion polls. Our culture is pervaded by words and ideas from the social sciences, and they are integral to the ways we define and understand ourselves.

What are the Social Sciences?

The disciplines that make up the social sciences—anthropology, economics, political science, psychology, and sociology—share a goal: the objective study of human behavior in all its social and cultural aspects, in cultures past and present. An ambitious goal indeed! But where to begin? By learning the language? Studying the customs and social organization? Examining the religious beliefs, economic practices, or laws and government? Actually, any of these can be a doorway into understanding a culture. But no matter what door you come in, you'll probably find yourself wandering into adjacent rooms. The social sciences complement and enrich each other.

Because social science covers so much ground, its practitioners specialize. They choose their turf, focusing on particular dimensions of social life as they examine the world. If, for example, a group of social scientists were talking about the problem of teen violence, they would be drawn to different facets of the problem:

- A political scientist, interested in where political power lies and how it is used, might emphasize the power of the gun lobbies and their success in preventing the passage of effective gun-control legislation.
- An anthropologist, intrigued by cultural artifacts, might point out how many of our cultural products, from movies to video games, glorify violence and flashy weapons.
- A sociologist, sensitive to the important role of the family in creating social structure, might focus on the large number of latchkey kids who come home to empty houses.
- A psychologist, attentive to more individual factors, might note that many teens have not yet developed good anger-management skills.
- An economist, attuned to financial matters, might want to do a cost-benefit analysis of any suggested interventions, to see what approach might be most cost-effective.

All of them make important points. Like most social problems, this one can profitably be examined from many perspectives.

The Lessons of the Social Sciences

While it can be a bit overwhelming to contemplate how many dimensions there are to social problems, the process of challenging us to look at the world from another and still another perspective is one of the social sciences' greatest services. By increasing our awareness, they remove personal and cultural "blinders" that prevent us from seeing dynamics within and around us. They show us other possibilities, other perspectives; they help us reframe (another psychological buzzword) situations. And all of that increases our freedom and our options.

Freud once described the goal of psychotherapy as "Where id was, there ego shall be." Stated more broadly, this is a goal of all social science: that processes operating outside our awareness be brought into consciousness, where we may examine them and choose how to behave. Peer pressure, for example, existed long before social scientists gave it a name. But doing so has made it easier for us to view the phenomenon objectively, rather than simply experiencing it subjectively. And having a more objective view is empowering.

Social scientists themselves struggle with blinders. All of us bring our own set of experiences, expectations, and values to all that we do. Personal and cultural factors affect what we notice in a situation, how we label it, and how we interpret it; and social scientists are not immune to this human phenomenon. Social scientists strive to separate their personal biases from their work, yet the field is still home to heated debates about whether certain theories are driven by objective observation or ideological bias. Recovered memories and "trickle-down" economics are just two of the topics that have been subjects of recent controversy. The challenge of trying to see the world objectively is an ongoing one.

So too is the process of applying the lessons of the social sciences in the real world. From the beginning, social scientists were motivated in part by the belief that greater understanding of human beings and their social environment could lead to a better society. Today, many vital social activities, from parenting to educating to "growing the economy" to governing, are informed by the work of social scientists. The social sciences have helped us understand our world better, act more effectively within it, and be happier with ourselves and the choices we make.

The social sciences inform, intrigue, and inspire us. They broaden our horizons and deepen our understanding of what it means to be human. They prompt us to argue and to wonder. The questions they explore touch us to our core, and our world wouldn't be what it is without them.

Understanding Society

Understanding Ourselves

Social Sciences

When we planned this issue, one of our first questions was: What exactly does a social scientist do? The social sciences include anthropology, sociology, economics, psychology, and political science, so we knew we'd have to talk to people in each of these fields. We quickly learned that within these fields are a wide range of subfields and that social scientists study topics ranging from what comic strips say about race and gender to why teens abuse alcohol to how people make investment decisions.

So what exactly does a social scientist do? To best answer that question, we asked six graduate students in different fields to talk about their research and their plans. By grouping their articles together, we hope to give a sense of the diversity of the field and of the possibilities [illegible] anthropology, [illegible] psychology, political science, and economics.

ANTHROPOLOGY

by Stanford W. Carpenter

Broadly defined, anthropology is the study of culture. This discipline is divided into four overlapping fields—archaeology, linguistics, cultural anthropology, and physical anthropology—that examine culture in different ways. Archaeologists excavate artifacts in order to study the past, while linguists study the development and use of language. Cultural anthropologists conduct ethnographic interviews in order to study contemporary cultures, and physical anthropologists observe animals and excavate human and animal remains to understand the development of humans over time.

Each of these four fields is further divided into subfields. For example, maritime archaeology, visual anthropology, sociolinguistics, and paleontology are subfields of archaeology, cultural anthropology, linguistics, and physical anthropology, respectively. While anthropologists specialize in one of the four fields, most anthropological research requires knowledge of multiple fields or subfields. My area of specialty is cultural anthropology.

There is a long history of debate among scholars, critics, politicians, and the general public over the role of entertainment media in our society. I am working on a doctoral dissertation that looks at how comic books are made in order to understand how they contribute to people's ideas about race, gender, and ethnicity. While my focus is on comic books, the questions that my research addresses could be applied to other entertainment media, such as video games, animation, television, and motion pictures.

My research, which has me dividing my time between Washington, DC, and New York City, has three major components. In Washington, DC, I conduct archival research at the Smithsonian Institution and the Library of Congress on the history of images of women and minorities. In New York City, I interview comic book artists, writers, and editors about the progress of their work in order to determine how decisions are made that affect the images on the comic book pages. In addition, I have to read lots of comic books and trade magazines in order to follow the comic book and related entertainment industries.

I came to this research by accident. When I was young, I collected comic books. By high school I was interested in becoming a cartoonist, but, as an African-American, I couldn't find stories about characters who looked like me. So when I went to Oberlin College for my undergraduate degree, I decided to take courses in archaeology, anthropology, and black studies so that I could get exposed to a wide range of stories. I ended up majoring in archaeology and anthropology.

After graduation, I started my own comic strip using folktales collected by anthropologists and folklorists. During a trip to New York City, I made appointments with several anthropology professors to get feedback on my use of folktales for the comic strip. During one of these conversations, a professor at Columbia University suggested that I look into Columbia's master's program in anthropology. I took that advice and earned my master's at Columbia. Now I am working on my Ph.D. in anthropology at Rice University.

The most challenging aspect of my research is that I have to keep up with so many people and their work. For instance, when I go to New York I usually meet with editors during the day and freelancers between 6:00 p.m. and 3:00 a.m., which leaves very little time for sleep. Also, I have to read a little bit of everything. So it's not uncommon for me to spend several days reading comics that I don't like!

Even so, I must admit that it is fun to have to read comics books as part of my studies. However, the true rewards are much more personal. I've always had serious questions about the role of those funny images that grace the comic book pages. Now I get to address them and get my Ph.D. along the way!

When he's not working on his dissertation, ***Stanford Carpenter*** *works as a map maker and site illustrator for an ongoing archaeological dig that is exploring the settlement patterns of escaped slaves in the Caribbean and Suriname. He is a research associate at the Smithsonian Institution's Center for Folklife and Cultural Heritage and continues to produce art in his free time. (No photo available at presstime.)*

SOCIOLOGY

by Natalie Boero

Just one week into the very first sociology class I took as an undergraduate, I was sure that I would spend the rest of my life as a sociologist. Sociology gave me a name for a way of seeing that I had always possessed: the sociological imagination.

Sociology as an academic discipline came into being in the late 19th century. Early sociologists Emile Durkheim and Auguste Comte defined sociology as the "science of society." It was the hope of Durkheim and Comte that sociology would be able to help us uncover the processes and laws of social life as well as enable us to see ways in which society could be improved. In the 1950s, sociologist C. Wright Mills elaborated this definition when he described what he termed the "sociological imagination." Generally, the sociological imagination is a way of looking at the world in which we become able to see the "ordinary as extraordinary." For Mills, the central task of sociology was to enable us to understand our individual lives in terms of the social forces that shape them, what he referred to as seeing the "intersection of history and biography."

The core questions asked by sociologists revolve around this interaction between social groups, social forces, and individuals. Because sociology focuses on society generally, and society is never static, there are an infinite number of topics sociologists can study. The most central questions in sociology involve the major organizing principles of society: social class, race and ethnicity, gender, sexuality, and age, to name a few. My desire to probe more deeply into these questions inspired me to go to graduate school in sociology.

I am currently doing research in the areas of gender and medical sociology. As a feminist and a sociologist I am interested in how we learn to be women and men. How does what it means to be a woman or a man change over time and cross-culturally? How are sex roles and stereotypes perpetuated? How do we explain inequalities between men and women? As a medical sociologist I am concerned with how we come to define health and illness, how doctors and patients interact, and how one's gender, race, social class, and age affect health and access to health care. It is important for me as a sociologist not only to try to discover why things are the way they are, but also to imagine the way things could be different. What would society look like if there were no gender discrimination? How can we study the economic organization of society to help us figure out how we can bridge the gap between the rich and the poor? The possibilities for change seem endless!

I plan to finish my Ph.D. and go on to be a professor at a university where I can do research and continue to teach. However, for me, sociology is more than an academic discipline. It is a way of thinking, a method for answering questions about the world around me; and most importantly, it is a way to bring about social change.

Natalie Boero *is a Ph.D. student and teacher in sociology at UC–Berkeley. She earned a B.A. in sociology from Linfield College (OR) and an M.A. in sociology from UC–Berkeley. In sociology her areas of interest are medical sociology, gender, and social theory. Outside of sociology, her interests include fishing, camping, synchronized swimming, and sleeping (when she gets the chance!).*

CLINICAL PSYCHOLOGY

by Richard Hicks

Psychology is a tremendously varied field, but what most psychologists have in common is a shared interest in the human mind and behavior. Some pursue the generation of knowledge through research, while others are practitioners and apply the knowledge of research. Some psychologists do both. As a student in a clinical psychology Ph.D. program that adheres to a scientist-practitioner model of education and training, I am training to do both.

I came to psychology in a roundabout way. I always had an interest in math and science. After completing my B.S. in electrical engineering, I worked for several years as a product designer for a technology firm. I enjoyed the problem-solving aspects of the work, but I found myself wanting to work more directly with people. Meanwhile, I was finding much satisfaction in some of my volunteer activities—working with a youth mentoring program and also working in schools with children who were at risk for dropping out.

I decided to pursue doctoral work in clinical psychology partly because I could combine the problem-solving and quantitative skills of engineering with my interest in working with people. I was drawn to the field of clinical psychology in particular because it is so broad that I knew I could always find a way to make the work exciting and meaningful. As a graduate student, I've already worked in a number of different settings: I have done psychological assessments of children in schools, hospitals, and pediatric centers, and I've worked as a therapist in an inpatient psychiatric hospital serving adolescents. Next year I will teach abnormal psychology at the University of North Carolina. In addition, I have spent much of my time working on research.

My specific research interest is in adolescent substance use, especially alcohol use: how patterns of use develop during adolescence, who develops problematic patterns of use and why, and how it can be prevented and treated. As part of this research I am interested in understanding if and how depression may be related to heavy alcohol use for some adolescents. I have also been working on several related research projects being conducted by my advisor, Dr. Andrea Hussong. I am helping her examine how friendships, family relations, and personal characteristics can influence the level of risk for developing psychological problems during adolescence.

One of the reasons I chose and continue to enjoy clinical psychology is that this field overlaps with and draws from other areas of psychology. For example, my understanding of adolescent substance use is informed by, and informs, developmental psychology, social psychology, quantitative psychology, biological psychology, and cognitive psychology. Additionally, I like that clinical psychology allows me to work closely with people who are in need of help with their mental or emotional problems.

Through my work as a clinical psychologist, I hope to creatively use my research, clinical, and teaching skills in ways that have a positive impact on my community. Whether it is through helping adolescents deal with the ups and downs of life or using research to inform public policy, I look forward to contributing to the lives of others.

Richard Hicks** is a third-year graduate student at UNC–Chapel Hill. His newest hobby is selling (and adding to) some of his vinyl record collection through Internet auction. **Richard likes to travel during the summer and has plans to go Ayacucho, Peru, this year.

COGNITIVE PSYCHOLOGY

by Andy Leber

What is arguably the most complex and versatile machine on Earth? (Hint: you're using it right now.)

If your answer is the human mind, you're in agreement with many scientists who study cognitive and biological psychology. These scientists, myself included, are psychologists, but we're not the type of psychologists portrayed in the movies and the media; we spend a great deal of our time in the lab conducting experiments.

So, what do cognitive and biological psychologists do? Some questions we might ask include: How does memory work? How do we learn language? How do we perceive objects and faces? How do hormones and genetics mediate these behaviors? We attack these mysteries of the human mind from just about every angle available to scientific inquiry. These angles include simple behavioral experiments as well as cutting-edge neuroscientific methods: recording neural activity in the brain, taking "images" of the brain using high-powered magnets (fMRI), manipulating genes and hormone activity, and manipulating activity of certain brain regions.

To illustrate some of these techniques, imagine that you want to study *attention*. At any given instant, your senses are bombarded with a tremendous amount of information: the smell of lunch, the feeling of your clothes against your skin, the noise of the clock and rustling papers, your own breathing, the monotonous drone of your teacher's voice... Amazingly, you're able to filter out all of this irrelevant information to concentrate on doodling in your notebook! But how?

The different methodologies employed by cognitive psychologists have taught us a lot about attention. Behavioral experiments have provided insight on issues such as what most frequently and consistently captures our attention, how we distribute our attention, and how we shift our attention. Single-cell recording and fMRI have suggested that attention helps to raise neural activity in our sensory systems in a manner that gives priority to information of interest.

With all of the modern technology out there—and when computers beat people at chess—people are often misled to feel that humans aren't particularly special. I'll agree with that sentiment if you can show me a computer that can recognize faces, understand language, laugh at jokes, and enjoy music like we can. Until then, I'll remain completely awed by the capabilities we have; one of the most exciting things about studying such a complex and not-well understood system like the human mind is that a big, exciting discovery is always lurking just around the corner.

***Andy Leber** earned a **B.A. in psychology from Rutgers University and an M.A. in psychology from Johns Hopkins University,** where he plans to complete **his Ph.D. in 2002.** Andy is interested **in just about all kinds of** music and enjoys singing and playing guitar.*

POLITICAL SCIENCE

by Khalilah L. Brown

Whenever I tell someone that I'm working toward a Ph.D. in political science, I'm asked, "So, do you want to be a politician someday?" And my answer is always a very firm, "No, far from it!"

At some point, we have all been exposed to politics, whether running for student body president or participating in a rally to end violence. The process of politics governs every community. It determines how we select our president, which streets get cleaned after a big snowfall, how much money school systems get, what laws are passed, and even what brands of sneakers are sold in department stores. These examples only hint at how broad a discipline political science really is. Its five major subfields—American politics, comparative politics, international relations, political theory, and methods (quantitative and qualitative approaches to studying politics)—offer students of political science the opportunity to study topics as diverse as ethnic conflict, global economies, Machiavelli, and the judiciary.

My current work focuses on how race and gender influence people's voting behavior and political decision-making, and, in particular, how these identities shape the policy interests and needs of America's diverse population. I find this work especially satisfying because it combines my interests in fields outside of political science, including sociology, psychology, history, and ethnic study. I am also working on a research project that examines the role of African-American women in Congress and the struggles they face in combating both sexism and racism.

For me, pursuing a doctorate was particularly important because women of color are so under represented in this field. I also believe it's important to reveal the unique characteristics of various racial and ethnic groups and their impact on the American political and social fabric.

Earning a doctorate in political science can create myriad career opportunities, including working as a research analyst for a policy organization, consulting for a political candidate, heading up a nonprofit organization, or, my own choice, becoming a professor at a college or university. Although my ultimate goal is to become a professor, I have also dedicated my research to exploring topics that can help educate, empower, and galvanize others to become informed, responsible, and active citizens.

Khalilah L. Brown *earned her B.A. in government from UVA and is now pursuing a doctorate in political science at The Ohio State University, where she works in the Political Research Lab. In her spare time, Khalilah designs Web sites, travels, and spends time with family and friends.*

ECONOMICS

by Aaron Lebovitz

I started playing poker when I was ten years old. My friends and I would sneak up into my friend Bill's bedroom, at the back of the second floor of his parents' house, and bring out the nickels, dimes, and occasional quarters. Although I didn't realize it when I was ten, poker synthesizes several of the fundamental elements of modern micro-economic theory, including Game Theory, Choice under Uncertainty, Risk Aversion, and Financial Constraint. Grappling with these issues sparked my interest in economics, which ultimately led me to the University of Chicago and a Ph.D. in financial economics.

The economic issues of poker revolve around making rational decisions. Microeconomics, which is also called the Theory of Choice, studies precisely that: how do people make decisions? The flip side of micro-economics, called macro-economics, focuses on the big picture, studying the aggregate characteristics of an economy, such as inflation, unemployment, and crime rates. The best economics ties the two together, asking and answering questions like "How will parental advisory labels on video games change the appeal of the game both to parents and to kids, and how will those changes affect the number of people playing those particular games and other games?"

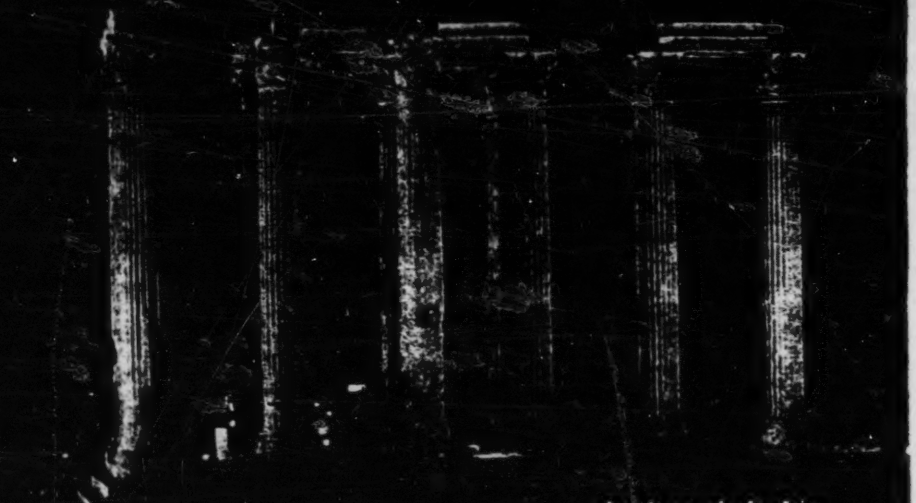
Economists study all forms of human organization, not just business and the industrial economy. We try to understand how and why people arrange to work together, or choose to work alone, in pursuing all kinds of goals, and how these choices are reflected in everything from prices to population dynamics. Our questions can range from the mundane (Why are so many people moving from suburbs into urban neighborhoods?) to the sublime (Why do people form the governments that they do? Why do they form governments at all?) to the absurd (How does the weather in New York affect how much people are willing to pay for shares of Disney stock?).

Economics is an interdisciplinary field that encompasses a wide range of subspecialties. For example, *economic history* interprets the origins and effects of economic institutions on historical events, while *public sector economics* analyzes law and government. *Resource economics* and *environmental economics* are concerned with the management of both scarce and public goods (or bads), such as wildlife, mineral ore, and pollution. *Econometrics* combines economics with statistics, providing a basis for testing economic hypotheses and developing quantitative forecasts. *Financial economics*, my field, focuses on the theory and practice of investment.

I spend most of my time thinking about a rather esoteric subject called asset pricing. I work on models that give insight into how uncertainty about economic growth changes with the underlying factors that contribute to growth. I enjoy working through the mathematical implications of the models I develop, but what drives me is the contribution I hope to make in understanding how people struggle with uncertainty. After graduation, I plan to join a faculty, continue my research, begin teaching, and prepare my Nobel prize acceptance speech. The nice thing about economics is that if my plan does not pan out, there are always jobs available from high finance on Wall Street to policy analysis in Washington.

Aaron Lebovitz *plans to complete his Ph.D. in June 2002. Aaron is also interested in wildlife management and conservation, and spends much of his time thinking about how to balance the goals of economic expansion and habitat preservation. He still enjoys playing poker and other strategy games. Most of all, he's looking forward to this summer, when he will become a first-time dad.*

What History Means to Me



by Sarah E. Lee

The following essay earned Sarah E. Lee the grand prize in the annual "What History Means to Me" Essay Contest. Co-sponsored by American Heritage and Prentice Hall, this contest challenges middle and high school students to relate historical ideas to life today and to their own lives in particular.

Mesopotamia. The Renaissance. Christopher Columbus. The Constitution. Civil War. Normandy. Martin Luther King, Jr. Sputnik. Vietnam. History is more than a series of events; it's more than just stories and pictures; it's more than just people. History is a unique combination of people, places, events and circumstances that come together to reveal the character of the peoples, nations and worlds of the past. Thus, when I look at history, a variety of thoughts and interpretations come to mind. Without the past, there would be no present. To me, that means that the study of history is more than just learning facts and studying ways of life. Rather history is a discovery of ourselves—a lesson in who and what we are.

Who am I? In today's eyes, I'm a student working my way through school so I can have a good job and succeed. However, who I am is so much more. I am my history. From the first of my forefathers who arrived in Henrico County, Virginia, from England on September 28, 1672, to my birth in Alexandria, Virginia, in 1981, countless ancestors have shaped what I would become. The first of my line born in the United States of America was born in 1675. My maternal great-great-great-grandfather served with Co. H, 64th and 22nd Georgia Battalions, during the Civil War. My great-uncle served in Korea. My grandfather served in World War II. Each of these individuals left his mark on the family and, in some way, on me. In their eyes, the eyes of the past, I'm an unknown. Perhaps I was a distant thought in their minds as they wondered what the future would be like. Yet they had no idea how much their lives would affect me.

Who am I going to be? That is where even more history comes in. What I will be is not just determined by choices I make. Countless people, family and friends alike, have also made choices that transformed me into what I am. Since what I am affects what I will be, numerous things have already at least partially shaped my future. Without Christopher Columbus's spirit of daring and pride, where would I be? How have Sputnik and other satellites influenced my character and personality by what I see and hear every day? Not just my direct ancestors have determined who I am; inventors, philosophers, explorers and numerous others have played roles in my history. My history is important to me. Without history, there is no way to learn from mistakes or remember the good times through the bad. History is more than a teacher to me; it's an understanding of why I am who I am. It's a part of my life on which I can never turn back. History is the one thing you can count on to never change; the only thing that changes is people's perception of it.

It cannot be denied that every aspect of the past has shaped the present, nor that every aspect of the present is shaping and will continue to shape the future. In a sense, history is me, and I am the history of the future. History does mean a series of events; history means stories and pictures; history means people, and yet, history means much more. History means the people of yesterday, today, and tomorrow. History means me.

***Sarah E. Lee** is a senior at Pebblebrook High School in Mableton, GA. When she's not involved in activities at school or church, she enjoys playing the viola, reading, and writing. Next year she plans to attend Toccoa Falls College where she will major in music education. She hopes eventually to teach music at the Black Forest Academy in Germany.*

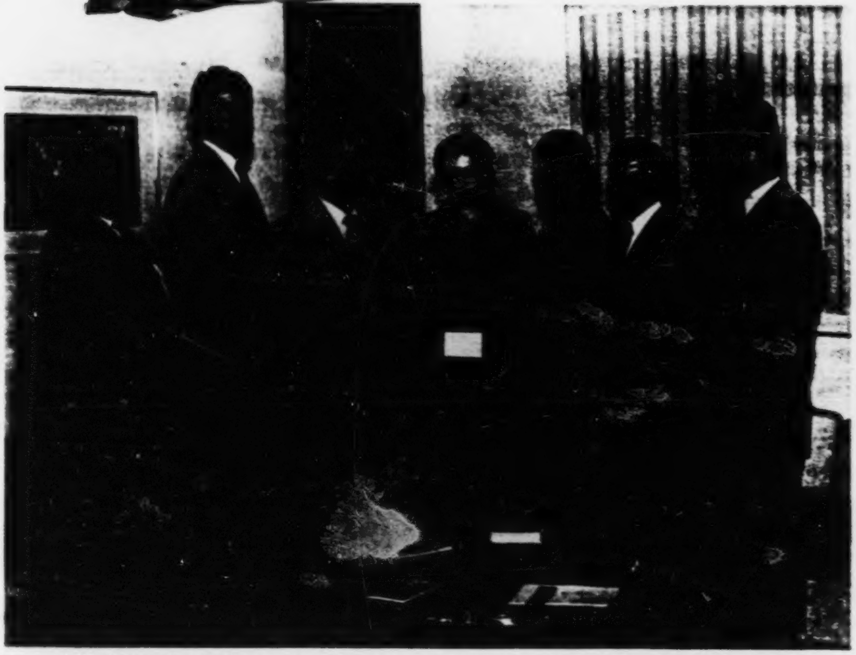
For more information about the "What History Means to Me" Essay Contest: Prentice Hall School Division, Attn: History Essay Contest, Room 2F24, One Lake Street, Upper Saddle River, NJ 07458; (800) 848-9500; http://phschool.com/head_ss/what_history_means/index.html

THE FED CHALLENGE:

Wearing Alan Greenspan's Shoes

by Jordan Gratrix

I am not your typical economics student. I've never been great at math, and before last year, the field of economics seemed to me nothing but a great expanse of numbers filling page after page. My only contact with economics was the report each night on the World News about the performance of the Dow Jones Industrial Average and the S&P 500 Index. But that all changed at the end of my sophomore year, when I learned about the Fed Challenge.



Severn School's 1999 Fed Challenge team after winning the 5th District Contest, from left: Coach John Bodley, Jordan Gratrix, Matt Kim, Katy Shelor, Neal Mundra, Alistair James (alternate), and Jin-Woo Chung.

Fed Challenge? What's That?

During a school assembly that May, it was announced that my school's Fed Challenge team had advanced to the national finals. It always grabs my attention when any club or team from Severn advances to the national level, and I was especially curious about the Fed Challenge because I'd never heard of it. After the assembly ended, I spoke to Mr. Bodley, the economics teacher who was also the coach of the team. I expressed my interest in learning more, and Mr. Bodley invited me to attend the competition as a spectator so I could see what it was all about.

When I entered the board room at the Federal Reserve in Washington, I saw five seniors from my school seated around one side of an enormous table. During their presentation, which lasted for about 15 minutes, each took a turn describing some facet of the American economy, illustrating their points with graphs on the projection screen. After the presentation, Federal Reserve officials grilled the students for another 15 minutes. I understood little of what I heard on the day of the competition, but I was very interested in learning to speak with the confidence and knowledge those team members clearly possessed. I decided that I would join the team the next year.

Building a Team

During the summer before my junior year, I began meeting with Mr. Bodley and one other interested student, mainly to review elementary economics terms and read articles from the *Wall Street Journal*. Our goal was to learn as much as we could about monetary policy, which is decided by the Federal Open Market Committee (FOMC) and determines the interest rates at which banks can borrow from each other and from the central bank of the U.S.

Eventually, we recruited four other people to join the team, which consisted of five members and one alternate. We all read tremendous amounts of material each week and poured our hearts into understanding monetary policy as best we could. By the time we reached our first competition in March, we were meeting almost every night to discuss the day's news and to create and rehearse our presentation.

> "As the date of the national Fed Challenge approached, we were meeting six times a week for a total of 25 hours each week."

At the Baltimore Branch championship, the members of our team assumed the roles of acting members of the FOMC and gave a 15-minute presentation on the general state of the economy. We focused on pressures upon the economy that might become inflationary, or cause prices to rise. We followed the main indicators used by the Fed (Consumer Price Index, Producer Price Index, Gross Domestic Product) and looked at many other indicators, such as unemployment figures, that might give us a better idea of whether prices would soon rise. After our presentation, we took turns answering questions posed to us by actual Federal Reserve Bank officials. It was a very different experience to sit at the table than it had been merely to watch the competition.

Of the 20 schools that competed, ours was one of only three that were invited back to compete for the chance to go to the district level. We won and advanced to the district finals, where we competed against two schools from Virginia. Again our hard work and preparation paid off. We were on our way to Washington, DC, for the national finals!

No Rest for the Winners

We knew that the national competition was going to be even more intense than the district, so we began working even harder to improve our presentation. As the date of the national Fed Challenge approached, we were meeting six times a week for a total of 25 hours each week. Even though we spanned two grades and had many different interests, we had to come together as a team. We needed to learn to make the best use of each other's strengths, so that when a question was asked there would be no awkward silence; whoever knew the most about that particular topic would begin speaking right away. This would make the team seem more polished and prepared in the eyes of the judges.

We traveled to Washington, DC, and competed for two days. On the first day, teams representing the participating Federal Reserve Districts competed until four teams remained. We made it to the top four, an accomplishment we were proud of, but we didn't win.

Still, we had a great time. We toured Washington and really got to know members of the other teams. But perhaps the most exciting part of the entire trip was when Fed Chairman Alan Greenspan came out of his office and addressed all the teams. It was thrilling to be in the presence of a man whose actions we had studied intimately for months.

If your school doesn't have a Fed Challenge team, try to start one. You will appreciate the lessons you learn, about both economics and true teamwork. Fed Challenge will also teach you to become an effective public speaker. The pride I feel when I watch videos of last year's contest and see myself rattling off figures, addressing monetary policy decisions, and offering my own opinions is indescribable. After having faced the judges in this competition, I cannot imagine myself being afraid to offer my opinion, if it is based on research, in any situation. I hold Fed Challenge as one of my greatest personal achievements.

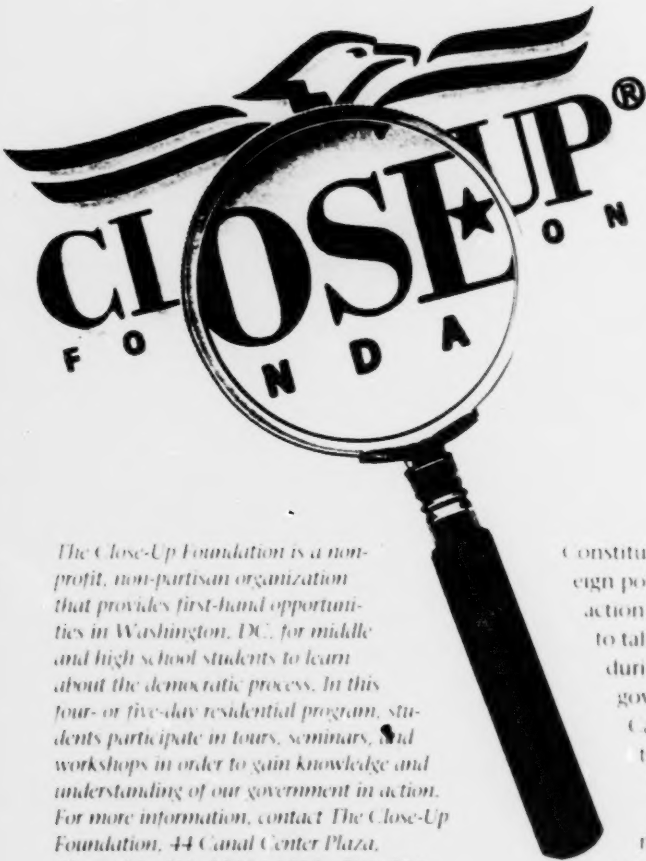
***Jordan Gratrix** is a senior at the Severn School in Severna Park, MD. He is a senior editor on the school's newspaper, played on the varsity basketball team, and will attend Davidson College next year.*

The Fed Challenge

Seven of the twelve Federal Reserve district banks organize contests in which students simulate the Federal Open Market Committee. High schools enter one five-person team in the area competition. Winners progress to the district level, where one team is chosen to represent that district at the national competition in Washington, DC. The winning team of the national championship will be awarded $50,000 in scholarships ($10,000 per team member), a $10,000 achievement award (for the teacher), and a $40,000 grant to set up an in-school economics laboratory.

Each of the other national finalist teams takes home $20,000 in scholarship money ($4,000 per student), a $4,000 achievement award (for the teacher), and an $11,000 grant to set up an in-school economics laboratory.

Participating districts are Boston, Chicago, Cleveland, Dallas, New York, Richmond, and St. Louis. Visit *www.bog.frb.fed.us/otherfrb.htm* to see which district bank represents your state and to link to its Web site, or visit *www.stls.frb.org/education/fedchal/overview.html* for an overview of the contest.



CLOSE UP® AND PERSONAL

by Jessica Sandoval

The Close-Up Foundation is a non-profit, non-partisan organization that provides first-hand opportunities in Washington, DC, for middle and high school students to learn about the democratic process. In this four- or five-day residential program, students participate in tours, seminars, and workshops in order to gain knowledge and understanding of our government in action. For more information, contact The Close-Up Foundation, 44 Canal Center Plaza, Alexandria, VA, 22314-1592; (703) 706-3659; fax (703) 706-0000; outreach@closeup.org; www.closeup.org

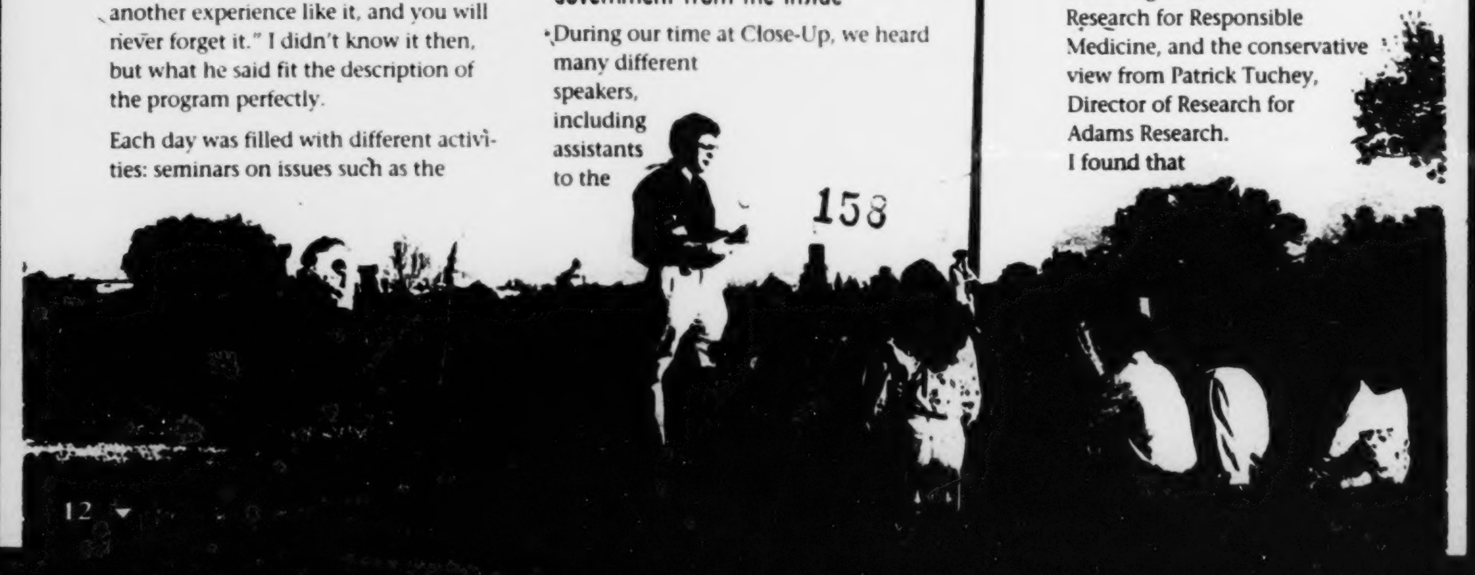
As I stepped off the plane from Michigan, ready to begin my adventure in Washington, DC, the only thought that raced through my mind was what my cousin told me a week earlier: "Do as much as you can, and take in everything you can at Close-Up. You will never have another experience like it, and you will never forget it." I didn't know it then, but what he said fit the description of the program perfectly.

Each day was filled with different activities: seminars on issues such as the Constitution, lobbying, U.S. foreign policy, and affirmative action; small group workshops to talk over the issues covered during the day; and tours of government offices like the Capitol Building and historic sites like the Lincoln Memorial. Whether arguing for the defense in a mock trial, editing a newspaper at the Newseum (a hands-on journalism museum), or discussing politics with a Presidential aide, I was constantly learning; even on the bus rides to and from exhibits, we discussed government. But the most important thing I learned was that history and government aren't just something to read about in books.

Government from the Inside

During our time at Close-Up, we heard many different speakers, including assistants to the President, producers from CBS News, professors, and officers from the Bureau of Population, Refugees, and Migration Affairs. Unfortunately, we attended Close-Up during President's Week, when Congress was not in session, so we didn't meet our senators and representatives; but we did meet two aides from each senator's office. Our meetings were held in the room where the House held the impeachment hearings for President Clinton. It was exciting to see such a historic place.

My favorite seminar was the one that featured speakers discussing the liberal and conservative viewpoints on important issues of the day, including gay rights, gun control, and affirmative action. The liberal perspective came from Steve Ragland, Director of Research for Responsible Medicine, and the conservative view from Patrick Tuchey, Director of Research for Adams Research. I found that



158

sometimes I agreed with the liberal side of things, but the next moment I was nodding along with the conservative side. For example, I agreed with Mr. Ragland that gay/lesbian marriages shouldn't be banned, but I also agreed with Mr. Tuchey on his pro-life position.

Throughout this seminar, I discovered that issues are often not black and white: sometimes they are more complicated than they seem at first. One of these was affirmative action, especially concerning the hiring of women. I agreed with Mr. Ragland that more women need to be hired for high-profile jobs, but I also tended to side with Mr. Tuchey's view that women ought to be able to make it on their own. This seminar made me realize that there isn't always a simple answer to a complex problem.

> **"Talking to people who have firsthand knowledge of how government works makes everything seem more real. To see government and history eye-to-eye instead of eye-to-book brings them alive."**

Government on Trial

We also learned how government works by trying it out ourselves. I especially enjoyed Mock Judiciary, in which each group held a mock trial based on a recent real-life case. Our group was assigned *Texas v. Johnson*, which questioned the constitutionality of laws prohibiting flag-burning. I chose to be the defense attorney and took the position that the law was unconstitutional. First we argued on the "state" level within our groups; then the losing side from each case wrote an appeal, which was turned in to the director. The best appeal was selected to be presented to the entire group on the "federal" level. While we lost our state case, our appeal was chosen to be argued to the group. One important insight for me in this process was how people's emotions get in the way of what is right and wrong. I had to persuade the group that what mattered wasn't how someone felt personally about an issue like burning the American flag, what mattered was the law. It was a thrilling moment when I learned we had won our case, because I knew I had influenced other people's opinions.

We continued our in-depth look at government each evening, when we met in groups of 20 for our small workshop sessions. Each workshop was led by an instructor, who would assign a topic for discussion based on our activities of the day. One evening, we made models of how each of our state governments worked and talked about what important issues were in the news in our home states. At the time, the big issues in Michigan were euthanasia (should it be legalized?), the driving law (should the graduated system of licensing stay in place?), and gun control (which seemed to be something every state was dealing with). It was a great way to learn about what was going on in different parts of the country, and it also offered an opportunity for the shyer people to express themselves.

Making the Connection

We spent part of each day visiting different places all over Washington, DC. One of the highlights of the trip for me was our visit to the Smithsonian, which featured a "Women in Government" exhibit. (I'm an auto buff, so I enjoyed the model car exhibit, too.) Another favorite exhibit was at the Library of Congress. As I'm a pianist, it meant a lot to me to see the actual manuscript of Gershwin's "Rhapsody in Blue."

We also toured the monuments, and it was moving to see things we had only heard about until now. We visited the Holocaust Museum, and I'll never forget the pictures that the children drew and the names of the townspeople on the wall of the exhibit. Another emotional experience was our visit to the Vietnam Veterans Memorial. My father served in Vietnam, and as I looked at the names on the Wall, I thought, *if my father's name was up there, I wouldn't be here right now to look at this.*

At the end of our session, the staff held a banquet for us, followed by a talent show and dance. We were all a little bit sad to see the session come to an end. We had made friends with people from all over the country, and we might not see each other again. But now, a little over a year since I participated in the Close-Up program, I am still in touch with some of my Close-Up friends. We each put a lot of ourselves into the program, and we received just as much from it.

Close-Up was definitely one of the most enlightening experiences of my life. There is a huge difference between reading about the Korean War and actually seeing the memorial to the soldiers who fought there. Talking to people who have firsthand knowledge of how government works makes everything seem more real. To see government and history eye-to-eye instead of eye-to-book brings them alive; for the first time, everything connects.

Jessica Sandoval, 18, is a senior at Regina High School in Harper Woods, MI. She will attend the University of Michigan–Ann Arbor in the fall to pursue a double major in Film & Video and Spanish.

Selected Opportunities and Resources in the Social Sciences

Talent Search Summer Programs

All four of the regional talent searches offer courses in the social sciences—such as psychology, economics, political science, and archaeology—for qualifying students. Offerings vary, so call for information or visit the following Web sites for specific information:

Johns Hopkins University CTY
(410) 516-0278;
www.jhu.edu/gifted/programs.html

Duke University TIP
(919) 684-3847; www.tip.duke.edu/programs/srp/index.html

Northwestern University CTD
(847) 491-3782;
www.ctd.northwestern.edu/programs/summer/index.html

Rocky Mountain Summer Institute
(303) 871-2983; www.du.edu/education/ces/si.html

Also visit *www.petersons.com/summerop/select/soaca.html* or check out *Peterson's Summer Opportunities for Kids & Teenagers 2000* (Peterson's Guides, 1999) to search for summer programs by academic discipline.

Anthropology/Archaeology

Center for American Archaeology Summer Programs
CAA Education Program, Center for American Archeology, P.O. Box 366, Kampsville, IL 62053; (618) 653-4316; CAA@caa-archeology.org; www.caa-archaeology.org

During one-, two-, or five-week residential programs, junior high and high school students can gain hands-on experience in excavation techniques and archaeological research. Summer programs begin in July.

Earthwatch Archaeological Expeditions
3 Clocktower Place, Suite 100, Box 75, Maynard, MA 01754; (978) 461-0081; info@earthwatch.org; www.earthwatch.org

Earthwatch offers 27 different archaeological expeditions in locations ranging from Belize to Utah. You can become part of a real research team on expeditions that take place throughout the year and last anywhere from a weekend to two weeks. The Web site contains extensive details about each expedition.

Smithsonian Institution Internships
Intern Coordinator, Office of Education, 1163 Arts and Industries Bldg., MRC 402, Washington, DC 20560; (202) 357-2425

The Smithsonian offers a summer intern program through its Office of Education. High school students from anywhere in the United States who are finishing their senior year may apply. This program, which offers small stipends, places 30 students in its two sessions.

UREP Expeditions in Archaeology
University Research Expeditions Program, University of California, One Shields Avenue, Davis, CA 95616; (530) 752-0692; urep@ucdavis.edu; http://urep.ucdavis.edu/arch.html

You don't need experience in archaeology to participate in the six different archaeological expeditions offered by UREP; you'll just need to pay a share of the project costs. Expeditions last for two weeks.

Center for American Archaeology field schools offer students chances to meet other intelligent and interesting students and explore prehistoric North America, all while experiencing the down-and-dirty joys of social science research. Photo courtesy of Center for American Archaeology.

Economics

Fed Challenge

See page 10 for an article and information about this contest sponsored by the Federal Reserve Board.

The Stock Market Game

Securities Industry Foundation for Economic Education, 120 Broadway, 35th Floor, New York, NY 10271-0080; (212) 608-1500; sifee@sia.com; www.smg2000.org

The SMG program is a 10-week simulation designed primarily for students in grades 4–12. At the start of the simulation, each team of three to five students receives a hypothetical $100,000 to invest in a portfolio of common stocks listed on the New York Stock Exchange, The American Stock Exchange, and the Nasdaq Stock Market. Teams with access to the World Wide Web use the Internet to follow their portfolios, research stocks, enter trades, and see their weekly ranking. Teams without Internet access may participate in a paper-based version of SMG.

Winners are determined on the basis of the equity in their portfolios at the end of the program, or, in some states, by an essay contest. Prizes vary by state.

History

National History Day

National History Day, University of Maryland, 0119 Cecil Hall, College Park, MD 20742; (301) 314-9739; hstryday@aol.com; www.historyday.org

Students conduct extensive research on a topic of their choice that relates to the year's theme and then present their findings in papers, exhibits, performances, or media presentations. Students in two divisions—junior division (grades 6–8) and senior division (grades 9–12)—may enter their work in one of seven categories. Approximately 100 students will win cash prizes of $500–$5,000 for superior work in a particular category; the top senior contestant will win a scholarship worth $75,000. **Deadline:** Check with your state coordinator (listed on Web site). District contests are usually held in February or March.

The Ralph Waldo Emerson Prize

Will Fitzhugh, Editor, The Concord Review, P.O. Box 661, Concord, MA 01742; (800) 331-5007; fitzhugh@tcr.org; www.tcr.org

To be considered for the Emerson Prize, students must first have their history essay published in *The Concord Review*, the prestigious quarterly journal that showcases the scholarly work of high school students. The four authors of the year's best essays win $3,000 each.

Submissions are accepted on a rolling basis. Submission form and guidelines are available on the Web site.

"What History Means to Me" Essay Contest

See page 9 for contact information and for last year's grand-prize winning essay.

Political Science

Boys State/Boys Nation

www.legion.org/bstate.htm

Local American Legion chapters nominate boys who have completed their junior year in high school to attend Boys State, which is held for one week each summer on college campuses throughout the country. After being assigned to one of two political parties, participants engage in mock legislative sessions, campaigning, party rallies, debating, and voting. Two outstanding participants of each Boys State will be selected to attend Boys Nation, where they will learn how government and the democratic process work on a national level.

Congressional Youth Leadership Council Conferences

CYLC, 1110 Vermont Avenue NW, Suite 320, Washington, DC 20005; (202) 638-0008; cylc@cylc.org; www.cylc.org

High school students are selected to participate in the National Youth Leadership Conference based on nominations from educators or NYLC alumni, or they may apply to participate through a competitive admissions process. Participants travel to Washington, DC, for one of 16 six-day sessions held throughout the year or for one of four 11-day sessions held during the summer. There, students learn politics and government from the inside, taking part in educational simulations and discussing issues with policy- and law-makers. NYLC alumni are eligible to participate in essay contests with prizes ranging from $250 to $1,000.

In addition, every four years CYLC holds the Presidential Youth Inaugural Conference, a six-day program that allows students to participate in the events of a presidential inauguration. Finally, CYLC sponsors the Global Young Leaders Conference, a 12-day program that brings together students from all over the world to explore global communications, diplomacy, peace and security, economics, law and human rights, and the role of the United Nations.

Students in CTY's Model U.N. Class share the challenge and the fun of debating global issues. Photo by Vilma Lonsdale.

Georgetown University International Relations Program

Special Programs, School for Summer and Continuing Education, Georgetown University, P.O. Box 571010,

BEST COPY AVAILABLE

Washington, DC 20057-1010; (202) 687-5719; www.georgetown.edu/ssce/spp/hsir.htm

This intensive eight-day program for high school students includes lectures by members of Georgetown's faculty and distinguished guest speakers, visits to organizations involved in foreign policy, small group discussions on current issues, and an international crisis simulation. The program takes place in July; applications are due in April.

Girls State/Girls Nation
Youth Programs Coordinator, American Legion Auxiliary National Headquarters, 777 North Meridian Street, Third Floor, Indianapolis, IN 46204; [illegible]; youthprog@legion-aux.org; www.legion-aux.org/gstate.htm or www.legion-aux.org/gnation.htm

Girls who have completed their junior year in high school may be nominated by their local American Legion Auxiliary to attend Girls State, which is held on college campuses throughout the country. There, girls are assigned to one of two political parties and participate in mock legislative sessions, campaigning, party rallies, debating, and voting. Two outstanding participants of each Girls State will be selected to attend Girls Nation, where they will learn how government and the democratic process work on a national level.

International Communication and Negotiation Simulations (ICONS)
Mike Miller, ICONS High School Coordinator, (301) 405-4145; mmiller@gvpt.umd.edu; www.icons.umd.edu

In four-week simulations, teams of high school students act as decision-makers and negotiators on issues of international importance. Each team represents a country and is linked to other teams via the Internet. Teams communicate both in daily messages and in real-time conferences.

Model United Nations Program
UNA-USA, 801 Second Avenue, New York, NY 10017; (212) 907-1300; unahq@unausa.org; www.unausa.org/programs/modelun.htm

The MUN program encourages students from grade 6 through college to explore global concerns and develop leadership skills through the principles of the democratic practice. In settings ranging from classroom events to state conferences, club members role-play diplomats and debate current international issues in simulations of U.N. activities. Drawing upon information gathered during intensive research and preparation, each member represents a nation and advocates for that nation's policies.

United States Senate Youth Program
Rita A. Almon, Program Director; William Randolph Hearst Foundation; 90 New Montgomery Street, Suite 1212, San Francisco, CA 94105-4504; (415) 543-4057

This program brings two high school students from each state to Washington, DC, for one week to observe the federal government in action and meet key officials. Students visit Capitol Hill, the White House, State Department, Supreme Court, and Pentagon and tour Washington landmarks. Delegates must be elected student officers or school representatives, selected by education officials in each state. Early fall deadlines vary by state.

Washington Workshops
The Washington Workshops Foundation, 3222 N Street NW, Suite 340, Washington, DC 20007; (800) 368-5688; www.workshops.org

The WWF offers a one-week Congressional Seminar (offered three times a year), a one-week summer Diplomacy and Global Affairs Seminar, and a three- or six-week summer Advanced Congressional Seminar/Capitol Hill Internship. Each seminar is limited to 120 high school students who are housed on the campus of Trinity College. Junior/middle school students choose from week-long seminars offered from January through June.

Web Sites

American Anthropological Association
www.aaanet.org

A lot of the information on this site is geared toward professional anthropologists or graduate students, but you'll also find some good introductory material. The brochures "What is Anthropology?" and "Careers in Anthropology" are especially useful.

American Psychological Association
www.apa.org

If nothing else, take a look at the list of the APA's 52 (!) divisions to get a broader idea of the diversity of the field. The site also contains resources on many contemporary issues in psychology, as well as resources for students contemplating entering the field.

American Sociological Association: Careers in Sociology
www.asanet.org/student/career/homepage.html

What can you do with a B.A. in sociology? What about an M.A. or Ph.D.? Find the answers here, along with a great overview of the field.

Fieldwork: The Anthropologist in the Field
http://urep.ucdavis.edu/arch.html

Dr. Laura Tamakoshi, who spent more than five and a half years studying the Gende in New Guinea, provides an engaging overview of what anthropology fieldwork involves, from planning and packing all the way through writing up the results. A fascinating narrative.

The History Net
www.thehistorynet.com

Extensive archives, lists of events and exhibitions, interviews, photographs ... if it's related to history, you'll find it here.

Investing for Kids
http://library.thinkquest.org/3096/

In addition to teaching saving and investing, the site contains the ThinkQuest Stock Game, which allows you to try out different investment strategies risk free. (No prizes are awarded in this game.)

The National Budget Simulation
http://garnet.berkeley.edu:3333/budget/budget.html

What trade-offs will citizens and policy makers have to make in order to balance the budget? Playing this simulation will give you an idea of what's involved.

A Pedestrian's Guide to the Economy
www.amosweb.com/pdg/

A fun and accessible introduction to the economy, this site begins with "The 7 Facts of Economic Life that Everyone Should Know" and leads into "A Whole Bunch of Intriguing, Confusing, or Controversial Issues in Our Economy." You'll also find lots of advice and recommendations along the way.

BEST COPY AVAILABLE

SENDING SECRET MESSAGES 21ST-CEN

The 2000 Intel Science Talent Search

by Carol Blackburn

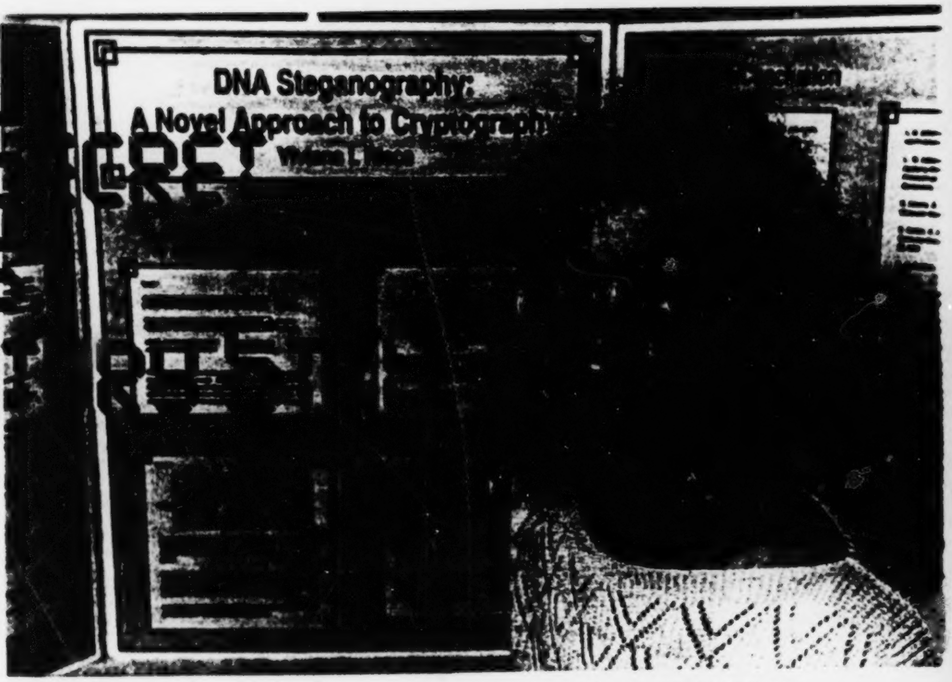

DNA Steganography:
A Novel Approach to Cryptography

Photo courtesy of Intel Corp.

Eight years ago, when her family emigrated from Romania, Viviana Risca could barely speak English. Now she's a published poet—and the first-place winner in this year's Intel Science Talent Search (STS), the nation's most prestigious precollege science competition.

"In my poems, I tend to explore my more vulnerable feelings. It's a nice counterpoint to my scientific pursuits," Viviana reflects. While her poems may be a means to reveal, her STS project explored a new way to conceal sensitive information—in DNA. "I'm very interested in novel applications for DNA. It's used as a code in nature. Why shouldn't we take advantage of it as an information-carrying medium in other ways?"

People with valuable information, from diplomats to businessmen to spies, are always looking for more secure ways to store or transmit their secrets. Messages encoded using the two-tiered method Viviana described in her project, "DNA Steganography," would be virtually impossible to decipher without a key, yet the ideas behind the work are "not really complicated," she assures. The first tier is one of simple encryption. Viviana wrote a code based on DNA triplets, where each "codon" refers to an alphanumeric character rather than an amino acid. She encrypted the historic message "June 6 Invasion: Normandy," then had a DNA strand synthesized that contained the encrypted message, flanked by two secret "primer" sequences.

White Rabbit

by Viviana Risca

**Run, white rabbit
hide in the basements of America
on the never-ending desert night roads
behind the flickering computer screen
you know the mice are chasing you
and cats & cops & shadows & clocks
beyond that tiny window
the rain beats fast and hard**

**Your heart beats faster yet, white rabbit
tell me, how do you sleep?
The satellites over your head
the microphones under your bed
listen to your dreams
with eyes and ears behind the glass
hunting the electricity
reflected in your eyes**

**Sleep, sleep white rabbit
your Alice is watching over you**

The DNA-based code wouldn't be much of a challenge to a self-respecting cryptographer. Rather, the power of this technique lies in the second tier, which consists not of encryption but of concealment or "steganography." Greek for "covered writing," steganography is a technique of hiding a message in the midst of lots of similar material. The haystack within which Viviana hid her message was the human genome. Only by knowing the secret primer sequences, which act as molecular hooks for retrieval, can someone pull the encoded message out of the mass of genetic material. And there are a trillion trillion possible primer sequences, making it virtually impossible to retrieve the message without knowing exactly what the primers are.

Viviana entered the encryption business two years ago, when Professor Carter Bancroft of Mount Sinai School of Medicine in New York City was a judge for one of her earlier science fair projects. Realizing from her project that she shared his interest in expanding DNA's repertoire, Bancroft invited her to work in his lab. He explained his innovative ideas for using DNA to conceal nonbiological information, and Viviana undertook the research for her STS project under his guidance.

"I'm fascinated by the ways molecular biology and computer science are borrowing and learning from one another,"

Continued on page 21

You already know that the Intel Science Talent Search and the Intel International Science and Engineering Fair recognize outstanding student research in areas as diverse as mathematics and microbiology. But did you know that these prestigious competitions also award prizes for projects in the social sciences?

The following two articles were written by students who have entered their social science projects into one or both of these competitions. Their articles offer a glimpse of not only the high level of work represented at the ISTS and ISEF but also the world of social science research.

Liar, Liar!

by Stefan Block

For four years I have been known as "that kid with the lies," and I am proud of it!

Since I was a freshman, I have studied and researched the patterns of lies in teenagers. Now, in my fourth year of research on deception, I have been chosen as a finalist in the Intel Science Talent Search (STS). Becoming a finalist in this competition has opened a world of opportunities for me. I feel certain that my participation in STS will play a profound role in shaping my future in science.

Truth or Consequences?

My interest in scientific research developed during a childhood filled with science books and a kitchen messy with the remnants of homemade (sometimes disastrous) chemical and electrical experiments. From fourth through eighth grade I was homeschooled, and I spent the majority of my time learning to conduct and write research.

When I returned to public school in the ninth grade, I was amazed at how much people had changed since I saw them in elementary school. A few of my friends had begun to lead lives that were foreign to me and vastly different from their previous lives. Drugs, alcohol, sex, and cheating were more common than I had ever imagined. Many of these students lied to hide their illicit activities from parents, teachers, and friends.

I decided I wanted to know if there was some way to determine when teenagers are being deceptive. I felt that if parents knew what was going on in the lives of their children, perhaps they could intervene, or prevent them from getting involved with drugs and other illicit activities in the first place.

Deceptive Practices

As I researched deception in teenagers, I discovered many interesting and sometimes surprising facts. For example, it's a common misconception that someone who is lying can't look you in the eye. Actually, most people who lie train their faces not to twitch or move while they are lying. Errors and hesitation in speech, slight movements of the hands, or slight shifts in posture are more accurate indicators of deception. So telling someone to "look me right in the eye and tell me that" may not help you detect lies after all.

One of the most exciting discoveries I made occurred in the control group of my third-year study. The subjects in this study received no training to help them detect when their partners were lying. The data revealed that these untrained teenagers became worse and worse at identifying deception by their partners over the course of the experiment.

Although I was quite surprised by this result, I found two studies that contained similar outcomes in adults. These findings could have startling implications for the parent/child relationship. These results have inspired me to take a closer look at lie detection in long-term relationships, examining how well parents can detect lying by their children, and whether training can help them improve detection skills.

For my current research project, I used 76 pairs of ninth graders as my subjects and had them record their reactions to various statements, some truthful, some not. Some of the students had been trained in detecting lies; some of them had not. I discovered that the best lie detectors were the students who had received some kind of training, but who also received feedback on the truthfulness of the statements they were hearing.

Preparing for the Big Leagues

I presented my first three years of research at many science fairs and symposia. I competed at the International Science and Engineering Fair in 1997 and 1999, winning the first place Grand Award at the latter. At the beginning of my senior year, I began to put all my findings together in a research project for the Intel Science Talent Search.

I soon discovered that applying for STS was not an easy process. The application involved a series of essays that forced me to analyze and describe several specific aspects of myself as a scientist. I spent weeks perfecting both the formal write-up of my research report and my essays. At the end of last semester, I placed the product of countless hours of work in an envelope, wished it luck, and sent it off to be judged with 1,600 other applications.

I was thrilled when, on January 10, 2000, I was named as a semifinalist, and I nervously awaited the announcement of the list of finalists. I was sitting in my science classroom on the morning of January 24, forcing myself not to get my hopes up, when a small army of Intel employees came in with noisemakers, Intel paraphernalia, and a letter from the Intel Science Talent Search naming me as a finalist.

Judging the Future of Science

The final competition, held in Washington, DC, on March 8-14, consisted of two phases. In the first phase,

Continued on page 29

Stefan Block *is a senior at Plano Senior High School in Plano, TX. Other than research, Stefan is involved with a number of extracurricular activities, including positions as editor-in-chief of his school newspaper and president of his school's science club. Stefan hopes to study neuroscience in college.*

BEST COPY AVAILABLE

The Science of People

by Laura Vernikoff

I've never liked science labs at school; they scare me. I'm always afraid I'm going to spill hydrochloric acid on my partner or blow up something important, like the school. But my project for the Intel Science Talent Search was different. My subjects would be people, not man-eating chemicals, and I would design my own experiment, an experiment that had never been done before.

Applying Psychology

My interest in my project actually began in an introductory psychology course I took the summer before my junior year at the Johns Hopkins Center for Talented Youth. In the class, we learned about how culture shapes people's development—in other words, what makes people tick. Some things we learned were fairly intuitive, such as if you repeat something over and over in your head, it helps you remember it.

But some of the things we learned were not intuitive at all, and I found these the most interesting. For example, if you have two people perform the same unpleasant task, and you pay one person a dollar and the other person 20 dollars, the one with the dollar will enjoy the task more. This is called cognitive dissonance, and it breaks down to this: the person who was paid 20 dollars can justify the unpleasant task by thinking, "I just did it for the money." The person who only got a dollar, on the other hand, can't use that justification, so he thinks, "Well, I can't have been doing it for money; I must have really enjoyed it." Strange but true.

Another counter-intuitive concept we learned was bystander apathy. This means that the more bystanders that are present at an emergency, the less likely it is that any of them will offer assistance. That's because the responsibility to act is spread across the whole group, so each person winds up waiting for the next person to do something.

This introductory course changed the way I looked at the people around me. It was the first class I took in which everything we learned seemed immediately relevant. I've always been interested in people, and that interest is what led me to my research project for the Intel Science Talent Search.

Seeing How We See

In preparation for the STS, I found myself under the mentorship of a wonderful man named Vance Zemon at Hunter College of the City University of New York. We worked together on a project comparing different ways to test vision without an eye chart. It's an important thing to be able to do, because the average infant can't read an eye chart, or at any rate won't read it aloud for you. But, as with most problems, the earlier you detect vision problems, the easier they are to fix.

The tests we compared have some subtle differences, but they all work on the same principle. A person sits in front of a computer screen as a black-and-white pattern changes contrast (the black turns white and the white turns black) and gets smaller. When the brain "sees" the pattern change contrast, it produces a response called a Visual Evoked Potential (VEP). The VEP can be measured using an electroencephalogram (EEG), which reads brain waves through small metal cups on the surface of the scalp. When the brain stops producing a VEP that can be detected by the EEG, it means that the pattern is too small for the brain to see.

One thing that surprised me was that my mentor and some other scientists had been using different techniques to test VEP acuity, but no one really knew which was most effective. At my mentor's suggestion, I decided to focus my experiment on finding some conclusive data as to which method worked best. I rounded up some friends from school to use as participants.

One thing I loved about the project was that I got to see how my friends' brains functioned when presented with the stimuli I designed. Both of the methods I was comparing used black and white

Continued on page 29

***Laura Vernikoff** is a senior at Hunter College High School in New York City. She spends most of her time running track and cross country. She hopes one day to become a scientist and a writer, and to have a photography darkroom in her bathroom.*

SHOCK ME!

Fascinating Findings of Psychological Research

by Rachelle Lipschultz

Because the woman on the left appears closer than the woman at the top, she seems to be ridiculously small—even though they are actually the same size.

When they hear the word "psychologist," many people immediately picture someone lying on a couch while a bearded man says, "Tell me about your mother...." The truth is, however, that the majority of psychologists are not therapists, and most who are do not follow the Freudian tradition. Psychologists study all aspects of human behavior, including personality, lifespan development, intelligence, brain structure, thought processes, group behavior, emotions, mental disorders, addictions...the possibilities are endless. The following examples come from research in diverse areas of psychology. Keep in mind that they represent only a fraction of the topics that psychology encompasses. And contrary to popular belief, not all psychology is common sense. You may be surprised!

Most people *would* obey an order to harm another person. In 1963, Stanley Milgram set up an experiment in which subjects, believing themselves to be "teachers" in an experiment on learning and memory, were ordered to give the "learners" shocks of increasing intensity after each wrong answer. (In reality, the "learners" were actors who never received a single shock. They were in a separate room, so the "teachers" could hear them screaming but couldn't see them.) The "teachers" were seated in front of a rather scary-looking board with switches labeled "15 volts—slight shock" all the way to "450 volts—XXX."

Before the experiment, a group of psychologists predicted that only a small fraction of the population—the true sadists and psychopaths—would give the highest level of shock. To everyone's surprise, Milgram found that ***65 percent*** of his subjects went all the way to 450 volts, and *none* of them stopped before 300 volts. The experimenter didn't have any real authority over his subjects—he was just a guy in a white lab coat who appeared to know what he was doing. The subjects weren't happy about what they were doing, but they continued because the experimenter was perceived to have legitimate authority, and because they felt that they were not fully responsible since they were only following orders.

(By the way, after it was over, the subjects were told that they hadn't delivered any shocks. They didn't leave thinking they had actually killed anyone.)

Interpretations of visual stimuli can be affected by the environment in which a person was raised. For example, when you look out the window of a tall building, you know that the people and cars below are not really as small as they appear (see photo above). The BaMbuti Pygmies in the Congo, however, did not know this, as anthropologist Colin Turnbull discovered in the late 1950s. The BaMbuti lived in a very dense jungle; they had never had the opportunity to look over long distances. One day, Turnbull and his guide, a young pygmy named Kenge, came to a large clearing. In the distance was a herd of buffalo, which Kenge thought were really the size of insects. As the buffalo came closer, Kenge thought that they were increasing in size due to witchcraft.

A neurological disorder called prosopagnosia causes a total inability to recognize faces, even in people who can otherwise see quite normally. One man with this condition compares it to being tone deaf—just as some people can hear musical notes but can't tell them apart, he can see faces but can't tell them apart. He relates the tale, for example, of the day he passed his mother on the street, looked right at her, and did not recognize her!

One of the easiest ways to get people to continue performing some action is to reward them for that action. (For example, you could pay a child to clean his room.) You could reward them every single time they perform the action, but then they would probably stop as soon as you stopped rewarding them. Instead, it's more effective to reward them intermittently. That way, when they don't get a reward right away, they will keep performing the action, because they feel that "surely I'll get rewarded eventually." Want to see this principle in action? Look no farther than the "one-armed bandits"—slot machines. It's rare for people to win large sums of money at the slots, yet they continue to feed quarter after quarter after quarter, because they are convinced that the machine has to pay off eventually.

Your memory may be easier to influence than you think. For example, subtle differences in the wording of questions may influence your answers. In one experiment, Elizabeth Loftus had subjects watch a video of a car accident. Later, some people were asked, "About how fast were the cars going when they hit each other?" while others were asked, "About how fast were the cars going when they smashed into each other?" People in the second group gave higher estimates than people in the first group; they were also more likely to falsely remember seeing broken glass on the ground.

Things that are paired together, even if they initially have no relationship to one another, may become linked in terms of how a person views them. This is why so many beer commercials feature beautiful women—although people are smart enough to realize that such women will not actually materialize out of nowhere when they pop open a can, they still unconsciously associate that brand of beer with the women. Thinking about these women makes them happy, so they extend that sense of liking to the beer.

Your body is paralyzed when you dream. That's to prevent you from acting out your dreams and possibly injuring yourself in the process.

***Rachelle Lipschultz** holds a master's degree in Applied Developmental Psychology from the University of Maryland, Baltimore County. She currently works at the Center for Talented Youth and teaches psychology in CTY's summer program.*

Selected Resources

Forty Studies that Changed Psychology: Explorations into the History of Psychological Research (3rd edition) by Roger R. Hock (Prentice Hall, 1995). An excellent overview of some of the most influential psychological experiments of all time, presented in an easy-to-read format.

Love's Executioner, and Other Tales of Psychotherapy by Irvin D. Yalom (Harper Collins, 1990). Ten accounts of a therapist and his patients, as they each undergo a process of self-exploration.

The Man Who Mistook His Wife for a Hat and Other Clinical Tales by Oliver Sacks (Touchstone Books, 1998). This is one of Oliver Sacks' many books dealing with the unusual and often bizarre phenomena which may result from brain dysfunction or disease.

The Story of Psychology by Morton Hunt (Anchor Books/Doubleday, 1994). Includes mini-biographies of many famous figures in the history of psychology, from Socrates and Plato to the present day. This book makes it easy to see different schools of thought in psychology and how they relate to one another.

The Wave by Todd Strasser (Laurel Leaf Library, 1981). A powerful non-fiction account of what happens when a high school history teacher introduces a new "movement" into his class in order to teach them about Nazism. This book deals with many important issues in social psychology, including peer pressure, obedience to authority, attitude formation, and stereotypes.

Secret Messages—continued from page 17

says Viviana, who plans to make her career in this exciting interface. Finding ways to combine and balance her passions—for science and art, for molecular biology and computer science—seems to be a gift of this accomplished young Renaissance woman.

This Year's Top Honorees

In addition to public recognition, STS finalists win college scholarships. First-, second-, and third-place winners received $100,000, $75,000, and $50,000, respectively. Fourth- through sixth-place winners received $25,000. Seventh- through tenth-place winners received $20,000. The remaining 30 finalists each received $5,000 scholarships. Each finalist also won a new Dell mobile PC with a Pentium III processor.

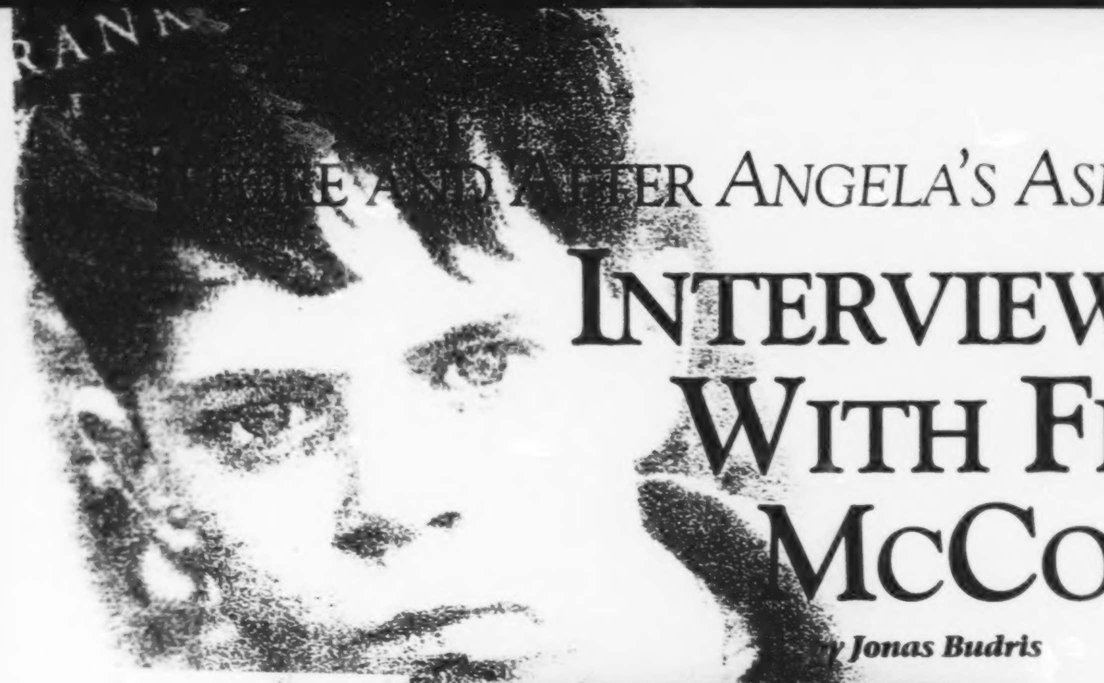
This year's top winners were:

1. **Viviana Risca**, 17, of Port Washington, NY
2. **Jayce Getz**, 18, of Missoula, MT
3. **Feng Zhang**, 18, of Des Moines, IA
4. **Alexander Schwartz**, 17, of Radnor, PA
5. **Eugene Simuni**, 18, of Brooklyn, NY
6. **Matthew Reece**, 18, of Louisville, KY
7. **Kerry Ann Geiler**, 17, of Massapequa Park, NY
8. **Elizabeth Williams**, 17, of Rolling Hills Estates, CA
9. **Zachary Cohn**, 17, of Dix Hills, NY
10. **Bob Cherng**, 17, of Fullerton, CA

For more about the STS and this year's finalists, see: www.sciserv.org/sts/

For more about Viviana's research see:

Clelland, C.T., Risca, V., and Bancroft, C. (1999) "Hiding messages in DNA microdots." Nature, *399: 533-534.*



BEFORE AND AFTER *ANGELA'S ASHES*:

INTERVIEW WITH FRANK MCCOURT

by Jonas Budris

Jonas Budris, then in the ninth grade, interviewed Frank McCourt last spring in Boston as the author was just finishing 'Tis, the sequel to Angela's Ashes. The sequel has since been published, and the film version of Angela's Ashes* was released this January. To preserve the integrity of the interview, we have kept references to these events in the future tense. A student-written review of the memoir appears on page 24.

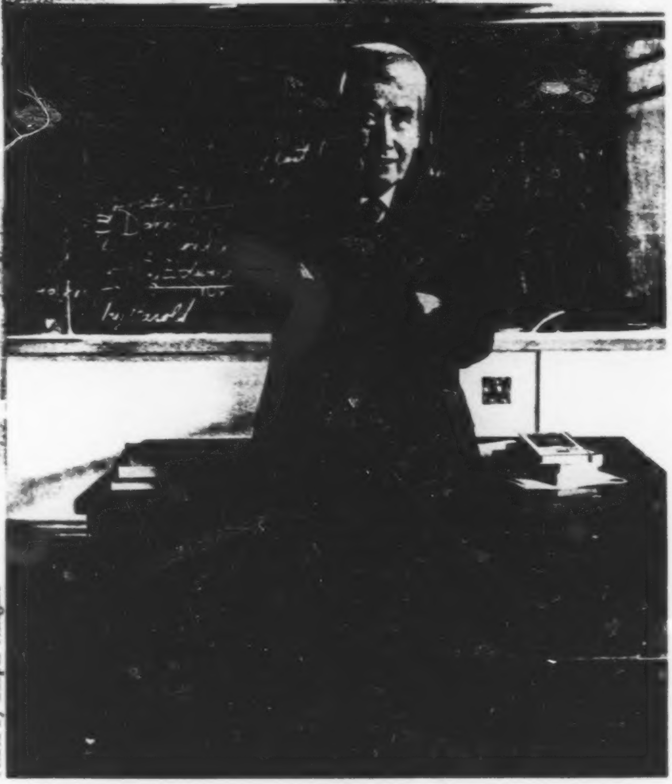


Photo by Gasper Tringale

When you wrote ***Angela's Ashes****, did you have even the slightest inkling that it would be so successful?*

Never. Never even a fantasy. I would need an ego as wide as a continent to think the book would prosper as it did. The first printing was very modest, just 27,000 copies. The latest figures are up into the millions. Even when it went to a second press run I never thought it would hit the best seller list. But now *Angela's Ashes* is translated into two dozen or more languages. Imagine, some kid in Istanbul is reading about my mother and brothers in Turkish, maybe sitting under a streetlight like I used to.

People tell me about being on vacation in fancy places and never going anywhere, just sitting in their hotel room and reading *Angela's Ashes*. One woman told me she stayed by a swimming pool in Cancun the whole time. Didn't go to the beach. She said, "I sat there in this beautiful Caribbean sun weeping. My friend said, 'What are you crying for, you're on vacation!'"

I have a friend who is a tough guy, a construction worker from New York. He was coming back from Italy reading the book. And on the plane he started to cry, and then laugh, and cry, and laugh again. One of flight attendants came over quite concerned until she saw the book and said, "Oh, I read that too. I know just how you feel."

The reaction to ***Angela's Ashes*** *was not universally positive, was it?*

There were some complaints from people in Ireland who'd never read it. I don't know where it is in the Irish American community. I've had letters from people calling me names, but very few negative letters.

---

*This movie is rated R for sexual content and objectionable language.

BEST COPY AVAILABLE

I've got boxes and boxes of letters. It's so very hard for me to read them anymore. So I started two boxes, the good boxes and what I call a negative file. I love the negative file. I love the letters that attack me. There's some guy who keeps writing to me from Texas. He calls me all kinds of names, four-letter words. I wrote back to him, and I said, "Thank you for your letter. Letters like yours keep me from getting a swelled head. I think we have the beginning of a beautiful relationship."

But my favorite was one from a lady in California. It went, "Dear Mr. McCourt, in order to write you I had to get your publisher's address. In order to get your publisher's address I had to retrieve your book from the garbage." I love the angry letters. But that file is very small.

"'Tis" is the last word of ***Angela's Ashes*** *and the title of the sequel. Has success, fame, and publicity altered the innocent voice of* ***Angela's Ashes'*** *narrator?*

No, because I'm not a novelist. I'm not making things up. I'm really more like a reporter going back, proceeding from where I left off in the last book, when I was 19 years old. Of course I will try to be true to that voice, that perception, but I don't know what it'll be. I write pieces from different parts of my life, then I fit them in, like a mosaic. The writing doesn't happen in a straight line. What's going to happen, I don't know.

And speaking of voice, that's one of the things I want to capture, what bowled me over when I came [to the U.S.] at 19: the voices. When I was 19, the voices I heard on the street had an energy I had never imagined—it's a symphony, really, when you put in the Jewish merchants, the Italian market keepers, the black kids. It's going to be very hard to put on paper—that feeling of a grand, new symphony—but that's what it felt like. *'Tis* will be the story of how I became an American, and, I hope, of how I became a man.

I hear ***Angela's Ashes*** *is being made into a film. Whenever J.D. Salinger was approached by Hollywood to make one of my favorites,* ***The Catcher in the Rye****, into a film he always said, "Holden Caulfield doesn't think so." Why does Frank McCourt think so?*

Because I'm not that precious or refined or literary. I'm just willing to take a chance and see what visions other people have. The people who bought the film rights to *Angela's Ashes* and the guy who will direct the movie are genuine. I trust them. Scott Ruden and David Brown are the producers. Scott did about 20 movies—*In and Out* and *Searching For Bobby Fischer*, to mention just two. David did *Butch Cassidy and the Sundance Kid*.

I have faith in them. But I don't have any creative control over the film. I sold it, and it's theirs. I'm a consultant; they can take or leave my suggestions. Maybe if I fight over it they'll listen, but in the long run it's the producers who have the final say.

Do you think the film will lose the heart of the book?

No, not the heart, but the language. Movies are image, not speech. All the panning and focusing and movement will take away from the basic language of the story. On the other hand, it will reach a wider audience.

Before you were a writer, you were a school teacher. What was your style in the classroom?

The trouble with most English teachers is that they start analyzing. Most teenagers are not ready to analyze T.S. Eliot or Yeats. So we would chant Robert Service, you know, "The Cremation of Sam McGee." And some students would say, "Mr. McCourt, is this going to be on the test?" "Forget the test!" I would say, and their eyes would bug out. This was a highly competitive public school in New York. They always wanted to know what was going to be on the test because their parents would tell them, "You are going to MIT!" So these kids were worried all the time. Couldn't enjoy themselves. I used to have them sing every Wednesday, and on Thursday we would read poetry. Imagine the scene now, with the kids worried about going to MIT singing "Who Threw the Overalls in Mrs. Murphy's Chowder."

What did your students teach you?

In the most boiled down way, they taught me how to be a writer. In an unconscious way, that is. I taught for about 30 years. I've had about 11,000 students. You can't stand in front of five classes a day and not learn what you're trying to teach them. If they wanted to write, I'd tell them to go home, to listen to their parents, listen to the old people coming and going. Listen to the stories that are already there. Fiction is not required. Well, what was I doing? I was teaching that lesson to myself.

I would tell them to have the courage to tell their own stories. And then the kids would ask me about my experiences, and I would tell them. And some of them said to me, "You should write a book." That is the most satisfying part of it: that all these years I've been in the classroom blathering away about poetry and literature and writing, and then I left and I wrote a book. I finally took the advice I gave to them.

Why did it take so long?

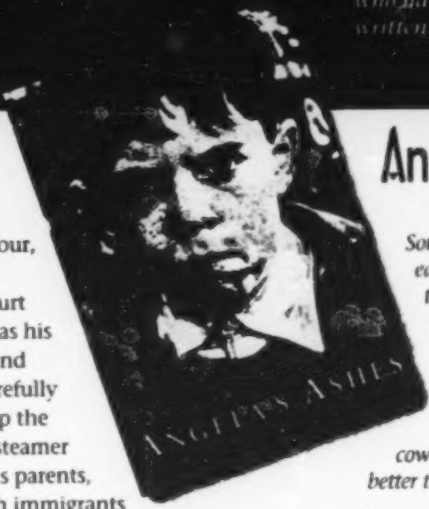
It was gestating, festering all those years. It's tough to tell the story of poverty, of what it does to people; of how my mother was humiliated; of how we all were put down and shamed and never given a chance to find self-esteem, sense of self. We were just scrambling all the time. That kind of poverty turns you into a little rat, always scurrying around for food, looking for this and looking for that. You have no sense of self and you're angry all the time. I think rats must be angry all the time as they hunt and are being hunted. In a sense we were being hunted, so I grew up angry.

It took me a long, long time to get over it. And it was that long process of teaching that helped me get over the hurt, helped me write this book, help me find that self, that worth. That's what those 11,000 students gave me. That warm relationship that thawed the cold and the damp out of me. That was the first success I ever had.

Jonas Budris *is a sophomore at the Martha's Vineyard Regional High School, which is on an island seven miles off the Massachusetts coast. He is an "M & M" student, he says, "math and music." A choral singer in several ensembles, Jonas also plays in the band and was selected to the Massachusetts All-State chorus this year. He has been a CTY and JHU Distance Learning participant since 1997.*

OFF THE SHELF

This issue's Off the Shelf was contributed by high school senior Christian Stayner who has also written book reviews for The Christian Science Monitor. A student-written interview of the author of Angela's Ashes *appears on page 22.*



Angela's Ashes: A Memoir*

by Christian Stayner

At age four, Frank McCourt watched as his mother and father carefully packed up the family's steamer trunk. His parents, both Irish immigrants barely making a living in Depression-crippled New York City, rounded up their four young boys, collected the last of their belongings, and sailed across the Atlantic to Limerick, Ireland. His parents' decision to return to Europe was, as McCourt says in the opening page of his 1996 memoir, *Angela's Ashes*, truly a mistake:

> *My father and mother should have stayed in New York where they met and married and where I was born. Instead, they returned to Ireland when I was four, my brother, Malachy, three, the twins, Oliver and Eugene, barely one, and my sister, Margaret, dead and gone.*

As the family lands on the shore of perpetually soggy Ireland, so die their hopes of starting life anew on their native land. The conditions in Limerick turn out to be even worse than in New York. It is "Lent all year long," as one of McCourt's relatives says. And, in the course of only a few months, McCourt's family is quickly reduced to complete poverty. His mother becomes a regular at the queues of the local Catholic charity, and his father at the local pub. For Frank, life is either spent studying for Communion or engaged in petty theft, walking along the banks of the River Shannon or running through Limerick for his job as a messenger boy. But despite the harshness of their lives, the McCourts attempt to make the best of the horrible situation in which they find themselves:

> *Sometimes two birds will be singing to each other across a field and I have to stop and listen to them and if I stay long enough more birds will join till every tree and bush is alive with birdsong. If there's a stream gurgling under a bridge on the road, birds singing and cows mooing and lambs baaing, that's better than any band in a film.*

When it seems things couldn't degenerate any farther for the McCourt family, conditions always have a way of getting worse. At one point, after they have burned all the coal they find littering the streets, the children are forced to take a hatchet to a dividing wall in the house. After the landlord's agent discovers their two-room apartment has become one room, the family once again packs up their belongings and moves in with relatives.

Quite amazingly McCourt lives through the hardship his family experiences in Ireland (several of his siblings did not), and he spares his readers no details: from his family's rotting teeth to the grime and filth of the slums of an industrial city to his father's crippling alcoholism. McCourt's hardship, however, is not without its exceedingly poetic language as well as touches of humor and pathos—a boyish wonder that resonates no matter how grim McCourt's conditions become.

The cause of the McCourt family's pains tends to be Frank's "Pop's" love of "the drink" rather than the economic conditions of their homeland. Sporadically employed, his father disappears with the family's measly dole (welfare stipend) each weekend, returning late at night to rouse his young boys to make them pledge to give their lives for Ireland. Again and again McCourt recounts variations of his father's drunken return from the pub:

> *Next day Dad walks in the door. His top teeth are missing and there's a bruise under his left eye. He says the Irish sea was rough and when he leaned over the side his teeth dropped out. Mam says, It wouldn't be the drink, would it? It wouldn't be a fight?*

Within the grime of Limerick, however, young Frank discovers Shakespeare, and a love for literature and the written word is what gives him purpose. "Shakespeare is like mashed potatoes, you can never get enough of him," McCourt enthusiastically proclaims. "That Shakespeare is that good he must have been an Irishman." McCourt seems to learn more from hours spent listening to Shakespeare on a neighbor's wireless than from his time under the tutelage of harsh Irish schoolmasters. But from the start, his family knows that freedom from the poverty of Ireland will come only through an education: "School, Frankie, school," a relative chimes as Frank assists him in delivering coal. "The books, the books, the books. Get out of Limerick before your legs rot and your mind collapses entirely."

Eventually, that is what McCourt does. After working, stealing, and begging, it is now a 19-year-old Frank who packs up his own belongings, leaves his family behind, and makes the trip back to America—where he has another chance at the McCourt family's American dream.

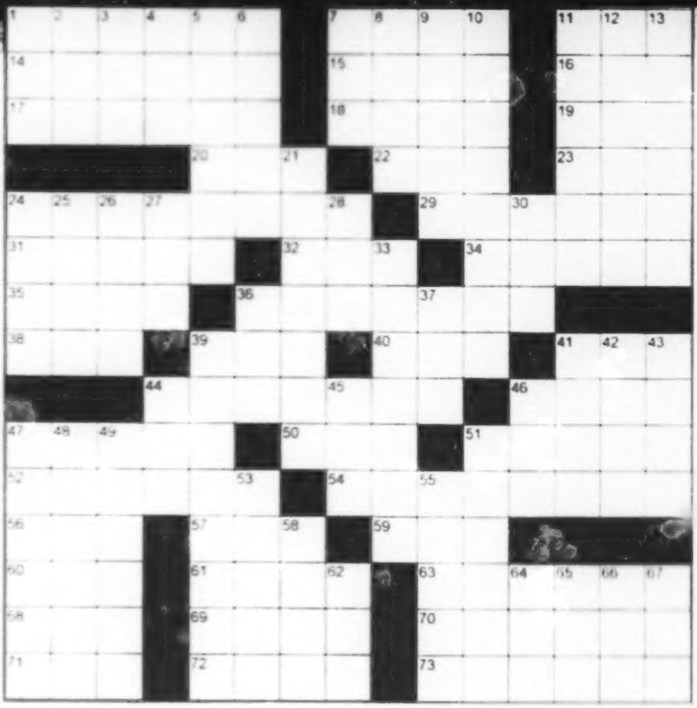
***Christian Stayner** is a senior at Harvard-Westlake School in North Hollywood, CA. Last November, Christian's review of Kent Haruf's* Plainsong *was published in* The Christian Science Monitor. *His diverse interests include planetary sciences, philosophy, literature, fine and performing arts, sailing, and fencing.*

---

*This memoir has been adapted into a movie that is rated R for sexual content and objectionable language.

Word Wise: Psychology

by Carol Blackburn



ACROSS

1 Colloquial name for the first insane asylum in England, founded in 1247

7 Very reluctant

11 Distinguished Service Order (abbr.)

14 Salary

15 Hector's home

16 No longer working (abbr.)

17 An obsessive's compulsion

18 Door decorations

19 Acronym for shock therapy

20 New Caledonia (3-letter country code)

22 Allow

23 Plural of is

24 Kind of slip

29 Forerunner of modern hypnotists

31 Cultural symbols

32 Op __

34 Pauses

35 He coined the word "introvert"

36 Literally, the "hunger of an ox"

38 Possessive pronoun

39 Even (poetic)

40 Sheep's call

41 Kind of memory (abbr.)

44 Angry

46 Hang open

47 Ms. Belafonte

50 Consume

51 Interior

52 Social prohibitions

54 One of the four temperaments in Roman medicine

56 Experiment in democracy

57 Research center

59 Mais __!

60 California time zone

61 Arabian nation

63 Famed banker

68 Bullfight cheer

69 Garb

70 Activate the sympathetic nervous system

71 See __ (get mad)

72 Milgram's academic home

73 Common defense mechanism

DOWN

1 Container

2 Chemical suffix indicating a double bond

3 Airline acronym for Washington National Airport

4 Luck of the draw

5 Reparations

6 Thank you, in Toulouse

7 Kind of memory (abbr.)

8 Developmental stage

9 Spirit guide

10 Illness attributed to a "wandering womb"

11 "The royal road to the unconscious," according to Freud

12 Concealed

13 Aquatic mammals

21 Gaps

24 Island nation

25 Mangled Curt

26 Many years

27 German ending indicating a noun

28 Zip

30 Body of water

33 Non-violent culture

36 Busy creature

37 Loco

39 Cause, in clinical parlance

41 Raja's wife

42 Candid

43 Bare

44 Filled to capacity (acronym)

45 More, in Mexico

46 African antelope

47 Catatonic state

48 Mild stressor

49 Let up

51 Repress

53 Site of Margaret Mead's research

55 Wanderer

58 Cry

62 Compass point

64 Reagan, for one

65 Graphical user interface

66 Snug __ _ bug (2 wds.)

67 First word of Dante's *Inferno*

Solution on page 29

Exploring Career Options:
Public Health

Interview [illegible]
D.A. [illegible]
M.D. [illegible]

by Carol Blackburn

Donald Henderson, Distinguished Service Professor and former Dean of the Johns Hopkins School of Public Health, has spent a lifetime battling infectious disease around the world. He directed the World Health Organization's successful global campaign to eradicate smallpox. Now, 20 years later, he confronts smallpox again, this time as a possible bioterrorist weapon.

Before we look at your career, could you give us a sense of the scope of public health?

The field of public health is perfectly enormous. Some people are concerned with infectious diseases, while others work on such diverse problems as refugee health, teen violence, environmental health hazards, and designing new insurance plans. We even have preventative health care experts in the aerospace program, studying the health problems of astronauts. It's impossible to characterize public health as a discrete entity; it really extends far beyond the reaches of clinical care of patients.

How did your interest in the medical world begin?

From the time I was a small child, I wanted to be a doctor. My uncle was a G.P., and I admired and wanted to emulate him. However, my career ideas changed while I was in college. There, I was editor of the yearbook and helped found a radio station, and I realized that I really enjoyed working with others and building a team. The idea of a career as a solitary practitioner was no longer appealing. When I went on to med school, I looked for ways to combine medicine and management. A role model there was the Dean of the med school, who seemed to be doing both. Of course, he thought I was crazy, because most M.D.s avoid, rather than embrace, administrative duties.

> “The last case of smallpox occurred in 1977. The end of smallpox was regarded globally as a tremendous victory. It was the first—and is still the only—disease to be eradicated worldwide.”

Did you learn about public health in med school?

No. I think we had one lecture on the importance of clean water, but that was about it. Even today, medical schools teach little about public health. The emphasis in medicine is on taking care of the individual patient. The amount of information that must be mastered in order to do that is immense, and little time is devoted to things that are not central to that goal.

So how did you make the transition?

At that time, in the 1950s, young men were required to serve military or uniformed service duty, and the Public Health Service (PHS) fulfilled that requirement. I wasn't interested in public health at the time, but I knew that if I went into the military with only an M.D. and a year of internship, I would be doing entry-level physical exams all day long, and that sounded really dull. So when someone from the PHS came along, recruiting for the Center for Communicable Diseases, I expressed interest. I didn't really like communicable disease work either—the rashes never looked like they did in the textbooks—but I thought that at least I would learn something. Once there, I quickly found that I loved the problem-solving nature of epidemiology and that public health is full of teamwork and management opportunities.

And from there?

I worked in the Epidemic Intelligence Service, a group that's been called the Disease Detectives. We were on call 24 hours a day to respond, on request, to epidemics wherever they occurred, in this country or abroad. When the call came, you were expected to be there the next morning, no matter where “there” was. It was very exciting and also somewhat anxiety provoking: you were going off to an epidemic of you didn't know what, or if you did know, you might not have had special training in that disease. So all of us kept libraries of reprints on infectious diseases, and the minute a call came, we'd grab relevant articles and read all the way on the plane. When you stepped off the plane, you were immediately into it, surrounded by newspaper people shouting, “What is this epidemic? Can you stop it? What are you going to do?”

And what *did* you do?

Our job was to find out what was causing the epidemic, then to advise local authorities on how to stop it. It's important to have a clinical background to do this kind of work. You have to be able to identify the infectious agent and how it's being spread. Many agents have different patterns of infection based on the means of transmission (such as contaminated food or water, airborne, direct contact), and perhaps only one of those patterns is a real danger from a public health standpoint.

It's also often important to understand the social system in the area, because what happens—why some people are afflicted and others are not, how the disease spreads—will depend on the local social life and practices. You really must bring to bear knowledge from many different sources and try to sort it all out. That's part of what makes epidemic work extremely challenging. I served as head of the Epidemic Intelligence Service for 10 years, and we worked on many epidemics that had huge implications in terms of the numbers of potential cases and deaths.

That was also true of the next phase of your career, the global Smallpox Eradication Campaign.

Many people don't realize just how big a problem smallpox was. It's a viral disease that kills 30 percent of the people who contract it, and even today, there is absolutely no treatment for it. The only tool we have against it is vaccination. We estimate that in the 20th century, at least 500 million people died of smallpox, which is a huge number. To put that number into perspective, *The New York Times* has estimated that in the 20th century, 100 million people died directly or indirectly as a result of armed conflict. Smallpox killed at least five times that number.

The global eradication of smallpox was a goal decided upon in 1966 by all the nations in the World Health Organization, and I was asked to head the program. Eradication was a feasible goal in the case of smallpox because we had an effective vaccine and because of the symptomatology of the disease. Infected individuals are obviously infected—no one is an asymptomatic, “Trojan horse” carrier of infection—so it is possible to

Continued on page 28

identify active cases quickly and prevent further spread of the disease.

We recruited people from 73 countries in all and traveled the world seeking out active cases, quarantining them, and vaccinating people who were not infected. Many of us worked 10-12 hours a day, seven days a week, living under very difficult circumstances. Vaccination teams sometimes had to walk for days to get to the more remote villages. It was a very difficult life, but a great experience. When you work with people to accomplish a major goal like this, a bonding occurs; you build bridges. The smallpox vaccination staff made real contributions to international understanding.

We were also sometimes able to get people to set aside local grievances, if only briefly. We had a number of "days of tranquility," when warring factions in a country would declare a truce so that we could come in, search for cases, and vaccinate for a few days. This happened even in some of the most troubled areas. It was amazing.

The campaign took almost 11 years. The last case of smallpox occurred in 1977. The end of smallpox was regarded globally as a tremendous victory. It was the first—and is still the only—disease to be eradicated worldwide.

After that stunning global triumph, you realized an early personal goal: you became a Dean, of the Johns Hopkins School of Public Health.

Yes. There, too, I got to oversee a diverse group of dedicated, highly skilled professionals doing good work all over the world. I remember the Dean of the Hopkins School of Medicine once saying to me, "I would bet that you [in the School of Public Health] save more lives in a year than we have saved in the Hospital in its entire 100-year history." "Yes," I agreed, "Many times over."

Tell us a little about public health education.

We don't look at individual patients or the detailed clinical nuances of diseases. We look at groups of people and how health problems manifest themselves in populations. It's quite a different orientation from medicine, and you don't think about disease causation or treatment the same after you've studied health and illness from this perspective. Most people who get a Master's degree in Public Health (M.P.H.) don't return to working with individual patients; they work with community initiatives.

Many of our students are mid-career professionals who find that they need additional tools to deal with the problems that concern them. Some have degrees in medicine, nursing, or microbiology; others, in engineering, statistics, behavioral sciences, or anthropology. Quite a number are from Third World countries. It creates a very interesting learning environment; most of our students have a lot of real-world experience and can contribute a great deal in class. Having fellow students, and later colleagues, from so many different academic and cultural backgrounds makes for a very rich and variegated existence.

After overseeing the global eradication of smallpox, you are now concerned with it again. Tell us about the Center for Civilian Biodefense Studies, which you founded in 1998.

During the Cold War, the Russians worked on and solved most of the problems of how to weaponize infectious agents; we know this from a top-level Russian defector. With the disintegration of the Soviet research community, some former Soviet scientists now work in countries where there are groups intent upon causing serious harm to the United States. The Department of Defense now considers biological weapons to be as great a terrorist threat as nuclear weapons.

Until about a year ago, our government's training of "first responders" involved police, fire, and emergency rescue teams, but no doctors or public health professionals. There was essentially no involvement of medical professionals in the planning for how to respond to bioterrorism.

That seems like an incredible oversight.

It was. It was absolutely stupid. And the training material on biological agents given to these "first responders" was just awful, full of inaccuracies. Much of it was designed for chemical, not biological, agents. It was a mess.

So the Center has taken the lead to try to set this process on a more rational basis. We've established a group of about 25 people, across many areas of expertise, to come up with a consensus as to which are the most important infectious agents to prepare to deal with and what to do about them. Almost any organism could be used for bioterrorism, but only a few could cause serious public health problems. We're publishing our findings and recommendations in *The Journal of the American Medical Association*, where the doctors and others can easily access them.

One of the problems we must address is the lack of expertise within the U.S. in the diseases of greatest concern. Most U.S. physicians have never seen smallpox, anthrax, or plague because those diseases simply don't occur in the general population. So we need to educate the medical community about what these diseases look like, what the risks are, and how to respond to them.

We're also working with city officials and hospital administrators to think through how their institutions would respond in a crisis. One hospital director, once he started thinking about it, said, "I don't know how we could man the hospital. Half of my staff are single parents. If something happens, they're going to go home to their families." Better to realize that now than in the midst of an emergency.

How the public would handle this sort of information is another concern. One of our staff members is a cultural anthropologist who is studying public reactions to stark tragedies, from floods and earthquakes to epidemics, to try to get a sense of what sort of public response we might anticipate. How many people would stay at their jobs, and how many are likely to flee for the woods? By anticipating problems like these, we can prepare more wisely and realistically.

After all the work you did to eliminate smallpox, it must be hard to plan for an outbreak of it.

Frankly, I resent it. There are so many public health problems crying out to be dealt with. To be spending time and money on a threat that is purely man-made ... it is very disheartening.

What do you say to young people interested in public health?

I feel that the future for public health has never been brighter. When I was a young man, public health was almost sidelined. There was an optimism that the antibiotics and vaccines we had would pretty much take care of health care. But as time has gone on, it's become clear that many problems cannot be "cured" on an individual basis but can only be addressed through public health initiatives: problems like AIDS, teen pregnancy, alcoholism, handguns.

The future also holds tremendous promise with regard to vaccines. That field has transformed over the past ten years as we've learned more about the immune system. I'm very optimistic that we're going to have vaccines for AIDS, malaria, and tuberculosis, which still ravage the Third World. If we had an AIDS vaccine ready to go, we could probably vaccinate 75 percent of the African population in six months. We know how to do a major vaccination campaign now.

We're also finding that some of the major killers in the First World, including heart disease and cancer, are caused at least in part by infectious agents. That opens up the possibility that, with vaccines and other means of manipulating the immune system, we can cure or even prevent those diseases. We're at the beginning of an exciting era of preventative health care, and public health professionals will be a big part of that.

For more about topics in this article, see: www.jhu.edu/gifted/imagine/links_75.htm

Liar, Liar—continued from page 18

all 40 finalists were interviewed individually by three different panels of judges. The interviews consisted of specific questions about our projects, as well as more general questions about philosophical and moral issues. In the next phase, the finalists set up displays of their projects in the Great Hall of the National Academy of Science for two days of public receptions and media interviews. During this time, judges were always close by, listening to how the finalists presented their research to everyone from Nobel laureates to grade school children.

The experiences I had at STS were nothing less than life-altering. The entire week, TV cameras and reporters followed us around, and I got to meet famous and fascinating people, such as House Majority Leader Dick Armey, Senator Ted Kennedy, and CIA Director George Tenet. Perhaps the greatest thrill for me, however, was the opportunity to talk with world-renowned teachers and researchers of science, such as Dr. Dudley Herschbach and Dr. Andrew Yeager.

Although I did not take a top award, I left the Talent Search with $6,000, a Pentium III laptop, and memories of a wonderful experience. In addition, as a finalist, I have been offered full scholarships to many of the nation's prestigious universities and have received numerous offers for exciting internships and jobs in science. I received much attention from the local media as well. The encouragement and creative energy I found through my participation in the Science Talent Search have filled me with a commitment to dedicate my life to the exploration of science.

Selected Resource

A Student's Guide to Conducting Social Science Research by Barbara Benedict Bunker, et al. (Human Sciences Press, 1999). This guide helps the social science researcher with everything from formulating a hypothesis to collecting data to writing up results. To order, call (860) 429-8118.

The Science of People—
continued from page 19

bars, but one method used six different bar sizes, and the other used nine. It would seem that the nine-bar method would work better, because more steps would have made it easier to detect the exact point where the bars got too small for the participant to see. However, to my delight, the six-bar method (my mentor's method) worked just as well as the other. It turned out that if the brain sees bars that are close in size, the same parts of the brain respond to them. Those parts get tired out and stop responding, so after a certain point, adding more steps doesn't make the experiment any more accurate.

My discoveries in my STS project have sparked my fascination with how the brain works. In college, I'd like to follow this interest by majoring in cognitive science. I'm also interested in artificial intelligence. I think we can learn a lot about how people think by trying to make machines think; applying artificial intelligence forces us to analyze how the brain performs basic functions, such as vision, that we sometimes take for granted.

More about... Freudian slip

Freud's term for this phenomenon, *Fehlleistung*, combines the words for "mistake" and "accomplishment." As psychiatrist Bruno Bettelheim wrote, "What happens in a *Fehlleistung* is simultaneously—albeit on different levels of consciousness—a real achievement and a howling mistake." Freud admired the ingenuity of the mental processes that enable the unconscious mind to speak by making the conscious mind mis-speak.

B	E	D	L	A	M	■	L	O	T	H	■	D	S	O
I	N	C	O	M	E	■	T	R	O	Y	■	R	E	T
N	E	A	T	E	R	■	M	A	T	S	■	E	C	T
■	■	■	■	N	C	L	■	L	E	T	■	A	R	E
F	R	E	U	D	I	A	N	■	M	E	S	M	E	R
I	C	O	N	S	■	C	I	T	■	R	E	S	T	S
J	U	N	G	■	B	U	L	I	M	I	A	■	■	■
I	T	S	■	E	E	N	■	B	A	A	■	R	O	M
■	■	■	S	T	E	A	M	E	D	■	G	A	P	E
S	H	A	R	I	■	E	A	T	■	I	N	N	E	R
T	A	B	O	O	S	■	S	A	N	G	U	I	N	E
U	S	A	■	L	A	B	■	N	O	N	■	■	■	■
P	S	T	■	O	M	A	N	■	M	O	R	G	A	N
O	L	E	■	G	O	W	N	■	A	R	O	U	S	E
R	E	D	■	Y	A	L	E	■	D	E	N	I	A	L

PLANNING AHEAD FOR COLLEGE

by Linda E. Brody, Ed.D.

In the early part of the 20th century, a prevailing myth was that gifted individuals were socially inept, sickly, often insane, and died young.

Lewis Terman's research in the 1920s changed that view. His extensive study found gifted students to be superior to comparison groups—not only in intelligence, but in their academic achievement and physical and emotional health. The legacy of this finding, however, was a new myth: that gifted students must be good at everything.

But many gifted students are not good at everything due to learning disabilities. This article focuses on helping gifted/LD students prepare for college. Fortunately, high schools and colleges are becoming increasingly prepared to make the accommodations necessary to help students with learning disabilities succeed.

College for Gifted Students with Learning Disabilities

Throughout history, many eminent people have had learning disabilities. Albert Einstein, Thomas Edison, Leonardo Da Vinci, and Nelson Rockefeller are just a few examples of gifted individuals who overcame learning disabilities to reach great heights of achievement. All of us have strengths and weaknesses, but gifted people with learning disabilities exhibit discrepancies between their potential and their achievement because their disabilities make academic achievement difficult. For gifted/LD students, college planning requires special consideration.

What is a Learning Disability?

Although there are many types of specific learning disabilities, they all relate to some difficulty with the way the brain processes information. If you consistently find that you can't remember what you heard in a lecture, it may be that your auditory memory is weak. Or if you had difficulty learning to read or you confuse math symbols, it may be due to problems with visual discrimination. If you are easily distracted and have trouble focusing for long periods of time, you might have attentional problems. Or perhaps you find writing difficult due to a weakness in your fine motor abilities. If you have experienced social difficulties all of your life, it may be that your weakness is in comprehending social cues.

Learning disabilities can affect your performance in all of your academic subjects in some way or may be limited to one, such as reading or math. Whatever the problem, assessment and diagnosis are critical to understanding what is wrong and determining what you need to help you achieve your full potential as a student.

Preparing for College

In preparation for college, all high school students need to take challenging courses, sit for required tests, and use free time wisely. If you also have a learning disability, depending on the nature and severity of the problem, the following steps will help prepare you to be a successful college student.

- Have an accurate, up-to-date assessment and diagnosis of your learning disability. Colleges will require this for any accommodations, but it's also important for you to fully understand your special academic needs.
- Secure copies of high school records that document test scores and accommodations that have been made. Evaluate these accommodations and consider which ones need to be continued in college.
- Analyze the impact of your learning disability on your high school record. If it has affected your grades, the quantity or quality of courses taken, or your extracurricular activities, be prepared to talk about this impact in college interviews and/or an essay.
- Consider taking a study skills course to improve your organizational skills. If organization is a problem for you now, college course work and independent living may be overwhelming.
- Become your own advocate. If your parent has taken the lead on your behalf until now, you need to begin to assume responsibility for determining—and advocating for—your own academic needs.
- Become proficient in using a computer. Students with weaknesses in organizational skills, writing, or spelling can often succeed in rigorous courses with the aid of a computer.
- If your diagnosis warrants it, arrange to have accommodations made when you take

standardized tests such as the SAT—such as taking it without time limits.

- Work on your social skills if that's a problem area for you. Practice talking to people, and seek counseling if needed.
- The effectiveness of medication for attentional problems can vary over time, so if you take medication, reevaluate its usefulness periodically.
- Research college policies regarding accommodations for students with learning disabilities. Contact the Disabled Students Office at the colleges you are considering.

Requesting Accommodations from Colleges

Although all colleges are legally required to support students with disabilities, the nature and degree of support vary on different campuses. For example, some colleges have full-time disability coordinators who can be extremely helpful if you need a variety of accommodations. Other colleges require you to negotiate with each individual professor.

Some accommodations that college students with learning disabilities have received include:

- lighter-than-typical course loads
- extra time to complete graduation requirements
- seating in the front of classrooms
- tests without time limits or orally administered exams
- tutorial support
- the opportunity to tape record lectures and/or to receive copies of notes from other students
- housing in a quiet dorm or in a single bedroom

With accommodations such as these, gifted/ LD students, who have a good academic background from high school and the motivation to succeed, can be highly successful college students, even at some of the most selective colleges in the country.

Could You Have a Learning Disability and Not Know It?

You would be amazed at how many students have learning disabilities that are not diagnosed until they are in college! If you have high intellectual ability but also subtle learning disabilities, it's not unusual for your problems to be masked until the work required gets much more difficult. If your grades are dropping, or if organizational or writing problems persist, find a competent diagnostician and get tested.

Selected Resources

Web Sites

Hoagies' Gifted Education Page
www.hoagiesgifted.org

LDOnLine
www.ldonline.org

LD Resources
www.ldresources.com

Resource Group for Gifted/Learning Disabled
http://208.6.87.17/users/rggld

Articles and Books

Accommodations in Higher Education under the Americans with Disabilities Act by Michael Gordon and Shelby Keiser (Eds.) (Guilford Press, 1998).

ADD and the College Student: A Guide for High School and College Students with Attention Deficit Disorder by Patricia Quinn (Magination Press, 1994).

College and Career Success for Students with Learning Disabilities by Roslyn Dolber (VGM Career Horizons, 1996).

Learning Disabilities and Alternate Learning Styles: A Student Perspective. Published by Brown University. To order, call 401-863-2315. Also available on *Imagine's* Web site: www.jhu.edu/gifted/imagine/links_75.htm

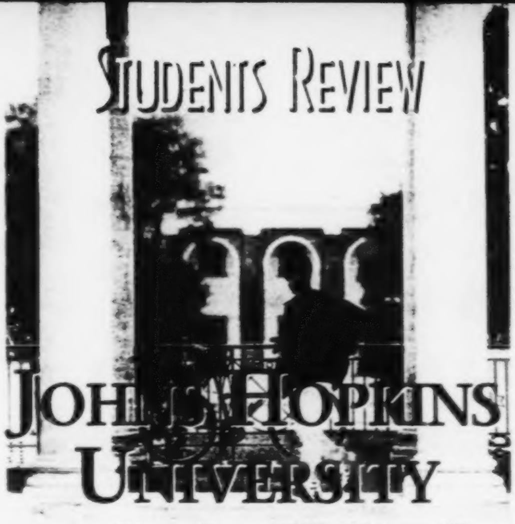
Peterson's Colleges with Programs for Students with Learning Disabilities or Attention Deficit Disorders by Charles Mangrum and Stephen Strichart (Eds.) (Peterson's Guides, 1997).

The Gifted Learning Disabled Student published by CTY, Johns Hopkins University, 1994.

"Gifted Students with Learning Disabilities: A Review of the Issues" by Linda Brody and Carol Mills. *Journal of Learning Disabilities*, May/June 1997. Available online at www.ldonline.org (see the "LD In Depth" section).

STUDENTS REVIEW

JOHNS HOPKINS UNIVERSITY



The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.

Our reviewers include 22 students, who major(ed) in biology (2), biomedical engineering (4), chemistry (2), economics (3), electrical engineering (2), English (1), geography (1), international relations (2), Latin American studies (1), materials science & engineering (1), math (3), music (2), physics (1), psychology (2), and writing seminars (2). (The number of majors exceeds 22 because several students have double majors.) Students' comments appear within quotation marks.

Quality of Academic Instruction for Undergraduates

Reviewers praised the caliber of the faculty and the education JHU offers, and the many opportunities for undergraduate research.

"Excellent. Academically, JHU is tops for preparing students to think critically, study efficiently, and balance time. Additionally, the level of material presented in courses is very high—I was much more than adequately prepared for medical school."

"The instructors are of the highest caliber and are usually fairly accessible, especially in upper level courses. An undergraduate at JHU can learn from world-renowned faculty in departments such as Biomedical Engineering, History, International Relations, and Writing Seminars. Research is strongly encouraged and opportunities are plentiful. The student body is generally very motivated, and classes are taught at a very high level."

"Hopkins is intense. The courses are demanding, the students are smart and serious, and the workload is heavy. Students routinely take 15-18 credit hours (5-6 courses) per semester. The absence of a core curriculum underscores JHU's emphasis on self-motivated education; you choose many of the courses you take. You can also design your own interdepartmental studies program."

"There are limitless opportunities to do research with people who are on the cutting edges of their fields. I was able to start working in an immunopathology lab during my sophomore year, even without a lot of prior experience."

"It really depends on the department. I had some **wonderful** experiences with professors in the Psych Department being helpful and accessible, but some of my friends in other departments have not. As an undergrad, you must be very outgoing with your professors; this is, after all, a very research-oriented school, and undergrads are not noticed unless they make themselves noticed."

"JHU offers great opportunities to pursue music and dance through cross-registration at Peabody Conservatory. My courses at Peabody have stretched my musical horizons, and the JHU shuttle makes it easy to move between the undergraduate and Peabody campuses."

Social Life

For the first two years, students live on campus, while for the last two years, everyone lives off campus. Reviewers value the friendships they made, but also note that students must actively seek out satisfying social outlets at JHU.

"The social life at Hopkins revolves around organizations—fraternities, teams, volunteer and religious groups, cultural organizations, and so on—but it's not dominated by any one kind of activity. This is both good and bad. It's good in that no one feels pressured to join a particular club or activity. It's bad in that students are often left to find their own fun on weekends without much structure to fall back on. JHU is certainly **not** a 'party school.' Upperclass social life revolves around the off-campus housing, as people come together and develop relationships that stem from the 'post-dorm' experience of living on your own. This creates a nucleus of friends who form your social circle at JHU."

"Despite Hopkins' reputation for not being a 'party school,' there is no lack of parties or activities to attend. We have big name speakers, quality performers like Adam Sandler and Bobcat Goldthwait, movies, cultural performances, etc. And while Baltimore is not New York, it has quality arts/music/night spots. It seems that the people who are unhappy at JHU are those who cannot keep up with the academic workload, who fall into the trap of studying to the exclusion of all else. It is important to be involved and not get too stressed over academics."

"The social life at Hopkins is totally lacking in student enthusiasm. I blame this on the students themselves. Most Hopkins students spend too much time locked in their rooms, studying. The administration has made real efforts to improve the quality of life for students, but too many students here don't appreciate the importance of study breaks. Studying all the time doesn't make you smarter. It makes you unhappy."

"I think there is a kind of self-selection process at work in creating the JHU student body (and social life). People who come here know JHU's reputation for having a lackluster social life, but they choose to come anyway. The majority of JHU students don't consider social life a very high priority in choosing a college; and once they get here, their lack of involvement in extracurricular activities is part of why the cycle continues."

What Do You Like Best About JHU?

The excellent academics and opportunities for research, the small size, and the friends reviewers have made were cited most often. Several also wrote that they really enjoy the highly competitive atmosphere.

"Excellent academics, diverse students, and a small liberal arts college atmosphere at a major university made Hopkins a great experience."

"The many opportunities to do research with outstanding people. If you are assertive, you can really do a lot and get invaluable help and advice as you formulate your future plans."

"The excellent academic preparation JHU gives for future endeavors. Many people from less competitive institutions do not make as successful a transition to professional/graduate school. JHU teaches you how to be motivated, efficient, self-reliant, and goal-oriented."

"I enjoy the smallness of the school, and I like the pressure—I thrive on it. I especially enjoy Peabody Conservatory; I love my classes there."

"The people I've met and the friends I've made. The research and volunteer opportunities at the Medical School are truly impressive."

"The competitive atmosphere and the high standards imposed by professors and upheld by most students. The rigorous academic life has really taught me a lot about myself and what my limits are. I feel I have finally become an adult ready for responsibility. I definitely didn't get that kind of molding in high school."

What Do You Like Least About JHU?

The competitive and goal-oriented atmosphere also has a dark side, and this was the feature most often cited in response to this question.

"Many students have an extremely competitive attitude. Learning is often sacrificed for opportunities to outdo your classmates. Often, instead of collaborating, students are pitted against each other. The competitive atmosphere can turn cutthroat, especially in pre-med and engineering courses. There is no greater insult at JHU than to be called a 'throat,' and the pure throat is a definite minority; but many people exhibit these attributes to a greater or lesser extent, adding to the overall stress level."

"The heavy pre-professional focus. Many students are very concerned with building their resumés."

"I feel that if you weren't highly focused before starting college, JHU would make it worse! It seems like only students who really know what they want thrive at JHU. Advising is good for pre-medical students, but it's easy for non-pre-professionals to fall through the cracks."

"The lack of community. It's everyone for themselves. It doesn't help that there is no on-campus housing for juniors and seniors, which isolates them from the campus community."

Who Would Be Most Compatible with the Academic and Social Atmosphere at JHU?

Reviewers agree that, while many kinds of people find a niche at JHU, the student most compatible with the academic and social demands of the place is one who can handle stress and a heavy workload and is very focused in his or her academic goals.

"Someone who is strongly academically motivated, does not give up in tough situations, can handle peer pressure, has a good sense of humor about his/her shortcomings, and does not need regular sleep. Being a born prodigy would help..."

JOHNS HOPKINS UNIVERSITY

Baltimore, MD 21218
(410) 516-8171

- 4-year private coed university
- Campus adjoins urban and suburban neighborhoods.
- Full-time undergraduate enrollment 1999-2000: 2,218 men; 1,556 women.
- Special features: Space Telescope Science Institute, Peabody Conservatory. Undergraduates may take courses at JHU's graduate School of Advanced International Studies (SAIS) and School of Public Health.

"Someone who is motivated, future-oriented, and dedicated."

"A cosmopolitan, independent, city-loving person who does not need to be pampered. Someone who knows what they want out of their education and can go after it. Someone who handles stress well and can perform under pressure. No naive, faint-hearted introverts should come here."

"We have all kinds of people here. In general, you need to be very driven, and you have to be socially creative—to create a sociable and fun life out of limited resources."

If You Had It To Do Over Again, Would You Go To JHU?

Eleven reviewers said yes, five said no, and the remainder had mixed feelings.

"Absolutely! I had the chance to study something in which I was really interested, to meet fascinating, driven, motivated people, and to explore my personal interests."

"Definitely. It certainly wasn't a walk in the park; there were many times when I doubted the wisdom of my decision to attend JHU. JHU does not hold your hand or baby you, but it does prepare you for the real world—something I can attest to now that I'm in it. Just as importantly, I met people who will be my lifelong friends."

"Not necessarily. I made my decision based on a limited set of criteria. If I had taken into account social life, cultural opportunities, and other factors that are integral parts of the college experience, I might have gone elsewhere. But I learned a lot there and met some great people. And I definitely value having an alma mater that commands as much respect as JHU does."

"Probably not. When I started college, I did not know what I wanted to do with my life. JHU does not provide you with good opportunities to 'explore yourself.' Rather, it serves as a stepping stone for people who know what they want to do as they proceed to grad school. I was not focused enough to take best advantage of JHU."

"No. I'd choose a school of the same academic caliber, but with more on-campus activities."

As you try to find the college or university best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or CTY.

THE COACH'S CORNER

Spotlight on the National and International Chemistry Olympiads

by Nadine Szczepanski

How would you like to spend two weeks during June in the majestic Rocky Mountains? What if you could turn those two weeks in the Rockies into two weeks in Copenhagen in July? Did I mention that both trips are free?

Okay, so you know you can't get something for nothing. To be eligible for the two-week study camp in the Rockies, you must be one of the top 20 high school chemistry students in the United States. Four of those 20 will be chosen to represent the United States at the International Chemistry Olympiad (IChO), which will be held in Copenhagen this year. To become one of those four students, you'll need a solid background in chemistry, excellent lab skills, and exceptional discipline. You'll need to draw on these three qualities to varying degrees at each step in the process leading to the IChO and at the IChO itself.

From the USNCO ...

The process begins with an exam, given by local sections of the American Chemical Society, that is designed to test students' background in chemistry. Most local sections use a 60-item multiple choice test covering topics similar to those covered in AP chemistry. About 900 of the students who take the local section exam are invited to participate in the United States National Chemistry Olympiad (USNCO), a four-and-one-half-hour national exam administered in late April. Part I is a multiple choice examination covering a broad range of topics such as thermodynamics, kinetics, stoichiometry, and equilibria. Part II is a free-response section that requires in-depth knowledge of chemical theories and models to solve multi-step problems. The third part of the exam, the laboratory practical, requires students to problem solve in a laboratory setting, to articulate their methods, to conduct an experiment, and to manage their time while performing multiple tasks.

... to Study Camp ...

The 20 top scorers on the USNCO national exam are invited to attend a two-week study camp at the U.S. Air Force Academy in Colorado Springs. This is where students most need strong discipline: they spend long days in lecture and lab and study at night. Their background in chemistry will be helpful, but they'll also be challenged to learn a lot more. During those two weeks, students cover a staggering amount of chemistry, including biochemistry and inorganic, organic, physical, and analytical chemistry at a second- or third-year college level.

The field of organic chemistry is typically the one our students have to work hardest to learn. High schools in other countries spend far more time on organic chemistry than we do in the U.S. All four of the U.S. students who competed in the 1999 IChO had at least some formal training in organic chemistry. Some were lucky enough to attend high schools that offered it; others took it at local colleges.

... and on to the IChO

At the International Chemistry Olympiad, students must be able to draw from their extensive knowledge of chemistry and apply their well-honed lab skills under intense pressure. The IChO format alone—a five-hour written theoretical exam and a five-hour lab practical—suggests the level of knowledge and concentration required. The topics and lab skills included on the exam vary from year to year, but they consistently go well beyond the level of high school classes.

The IChO brings together the top chemistry students in the world. Last year, 199 students from 51 countries participated, and the U.S. team placed first overall. The best in the world. Somehow even a trip to the Rockies and free international travel pale in comparison.

For more information about the U.S. National Chemistry Olympiad: American Chemical Society, Education Division, 1155 16th Street NW, Washington, DC 20036; (202) 872-4600; www.acs.org/education/student/olympiad.html

Sample Problems from the 1999 USNCO

Part I

1. How many moles of Na^+ ions are in 20 mL of 0.40 M Na_3PO_4?

(A) 0.0080	(C) 0.050
(B) 0.024	(D) 0.20

(continued)▸

This summer, ***Nadine Szczepanski*** *will spend the second year of her three-year term as a mentor at the Chemistry Olympiad Study Camp. Ms. Szczepanski is the Shonle Professor of Chemistry at MacMurray College in Illinois, where she has won the Dewey Wilkins Award for excellence in teaching. She has been a Big Sister for the last 12 years and enjoys bicycling, hiking, and traveling.*

Creative Minds Imagine

***Kathleen Bachynski** is a freshman at Groves High School in Beverly Hills, MI. She enjoys soccer, music, and reading, particularly philosophy.*

Friends

It doesn't take them any effort
to cheer me up.
All they need to do is be themselves—
spilling their Sprite all over the table,
playing loud and crazy games of chess, cards,
anything to stir up those competitive juices,
making fun of each another,
conferencing about homework,
explaining how to do a math problem,
watching a stupid movie together
just because one person really,
really wants to see it,
forgetting their lunch
and exchanging money
that nobody has to pay back,
tripping over themselves,
arguing over who is smarter,
nicer, prettier, better,
and always ending up laughing.
It's all their little idiosyncracies
that make me so fond of them.
And believe me
I know them all.

The Old Man and the Box

He has nothing but a box
filled to the brim with memories
of the girl he loved
but not quite enough,
of the dog he loved
but the dog died
and left him alone
in his empty house
with nothing but a box
filled to the brim with memories
of the brother he loved
but his brother was a pilot
and got shot down during the war
and his grave is the Atlantic Ocean,
of the sister he loved
but she married an Englishman
and moved away across the sea
and he never saw her again,
and all he has is his box
and he takes it out sometimes
but it makes him feel lonely
and he is
and he thinks of all the love he had
and wonders where it went
and he thinks about his life
and he feels sad
and would throw the box out the window
in desperation
but then he would have nothing.

Coach's Corner—continued from page 34

2. How many carbon–carbon bonds are in a molecule of 2-methyl-2-butanol?

(A) 2 (C) 4
(B) 3 (D) 5

3. The geometry of the atoms in the species PCl_4^+ is best described as

(A) tetrahedral (C) square
(B) see-saw (D) trigonal bipyramidal

Part II

Account for each of these observations about metals in terms of the properties of atoms and ions.

a. Metals conduct electricity well but nonmetals do not. Semiconductors conduct to an intermediate degree.

b. The electrical conductivity of a metal (such as iron) decreases with increasing temperature, but the electrical conductivity of a semiconductor (such as silicon) increases with increasing temperature.

c. Iron objects corrode when exposed to water and oxygen, but not when they are kept dry. Aluminum objects do not appear to corrode under either of these conditions.

Answers:

Part I: 1 B, 2 C, 3 A

Part II:

a. Metals consist of cations in a sea of mobile electrons that can carry current. Nonmetal electrons are held in localized covalent bonds. Semiconductors have a few mobile electrons.

b. When a metal is heated, cations vibrate and interfere with the electron movement. When a semiconductor is heated, more electrons are freed to move through the lattice.

c. Iron corrodes because of an electrochemical reaction that requires H_2O and O_2. Aluminum forms a thin oxide coating that prevents further reaction.

The complete 1999 National Exam as well as a link to the 1999 IChO can be found at www.acs.org.

KNOSSOS GAMES

By Tim Boester

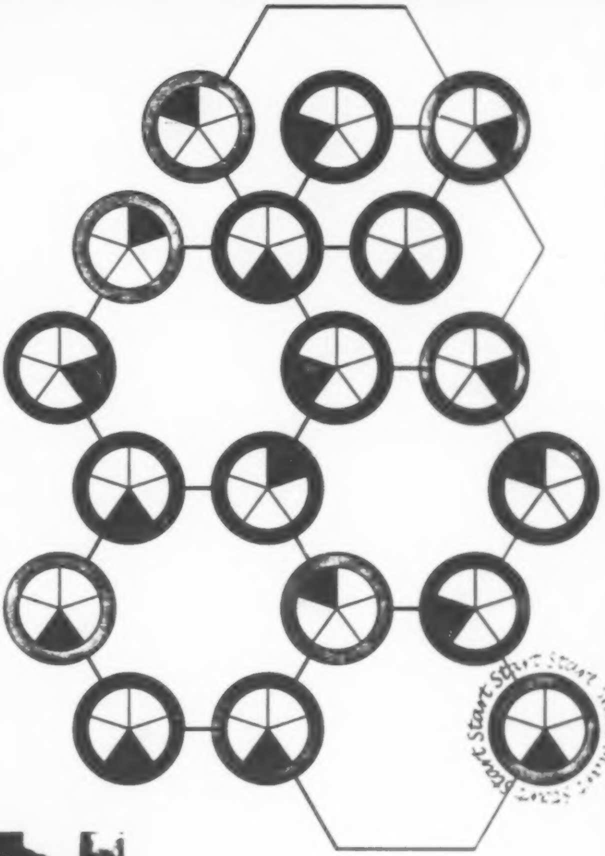
The Goal: To make all the black wedges point downward, like in the Starting circle.

The Rules: Jump from circle to circle, moving along the black lines. You have two possible opening moves: to the blue-rimmed circle northwest of Start or the blue-rimmed circle west of Start. The latter, longer move is a legal one.

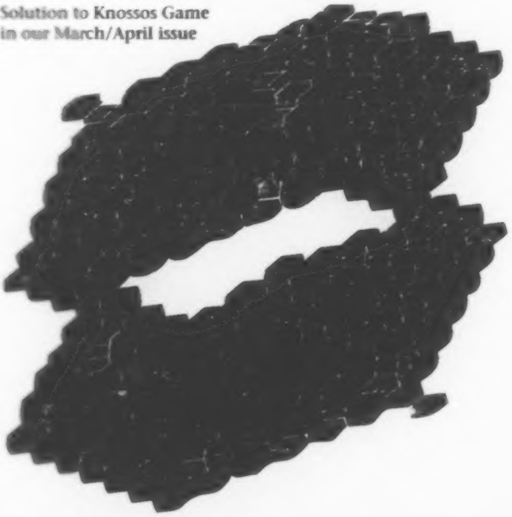
Each circle has a colored outer band. When you jump, the wedge inside the circle you land on will rotate according to the rules in the table at right. For example, if you jump from a red to a green circle, the wedge inside the green circle will rotate four "notches" in the clockwise direction

Note: Because of its open-ended nature, this puzzle has more than one solution. We will publish the shortest one.

◍	◍	↻	3
◍	●	↻	4
◍	●	↺	1
●	◍	↻	2
●	●	↺	3
●	●	↺	4
●	◍	↺	2
●	●	↻	1
●	●		0



Solution to Knossos Game in our March/April issue



*A graduate student in educational psychology at the University of Wisconsin, **Tim Boester** now has additional puzzles on his home page: homepage.mac.com/boester/*

BEST COPY AVAILABLE